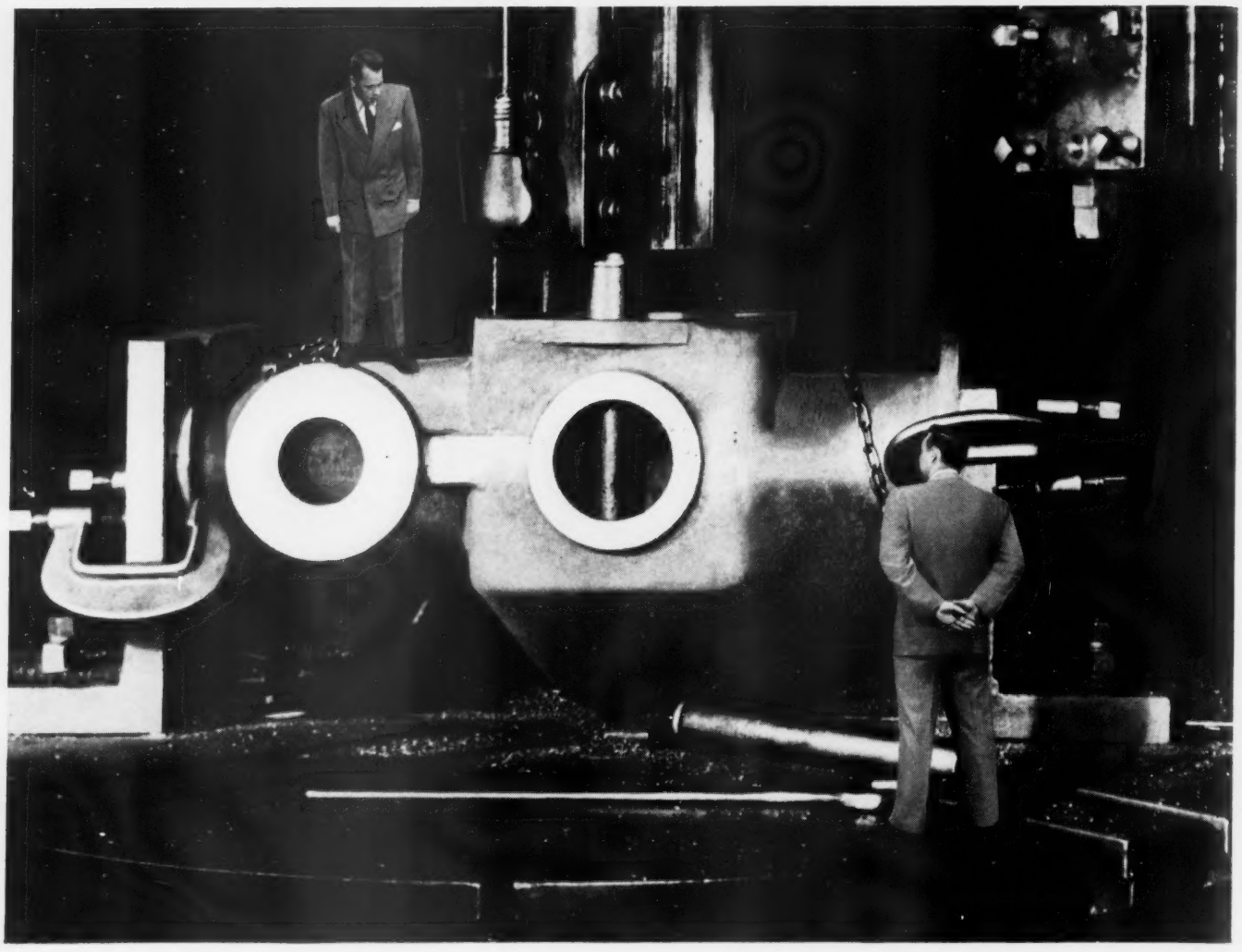
JUNE 1953

FOUNDRY

...WHEREVER METALS ARE CAST

CONVENTION REPORTS

Technical Developments Discussed at AFS Annual Meeting—page 102



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600 leading foundries are now producing *premium* castings—both gray iron and malleable—by deoxidixing with FERROCARBO patented briquettes. Are you among them?

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You get quick, low-cost installation. Allis-Chalmers distinctive free-floating design means a simpler, less costly foundation on new as well as replacement installations.

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Foundry-proved Allis-Chalmers shakeouts are available in single or multiple units for every foundry need. For more information, call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Only FOUNDROMATIC Shakeouts Give You All These Important Features

Plenty of vibration for largest loads within rating.

No shaft has ever broken on a *Foundromatic* shakeout.

All bearings rated to last a minimum of 5000 hours.

Only one dust seal on the mechanism.

Body weldment is stress-relieved for maximum resistance to shock impact loads.

Long-life flat deck of sufficiently thick plate to stand up under heaviest duty.

Effective belt tension assured by specially designed pivoted motor base.

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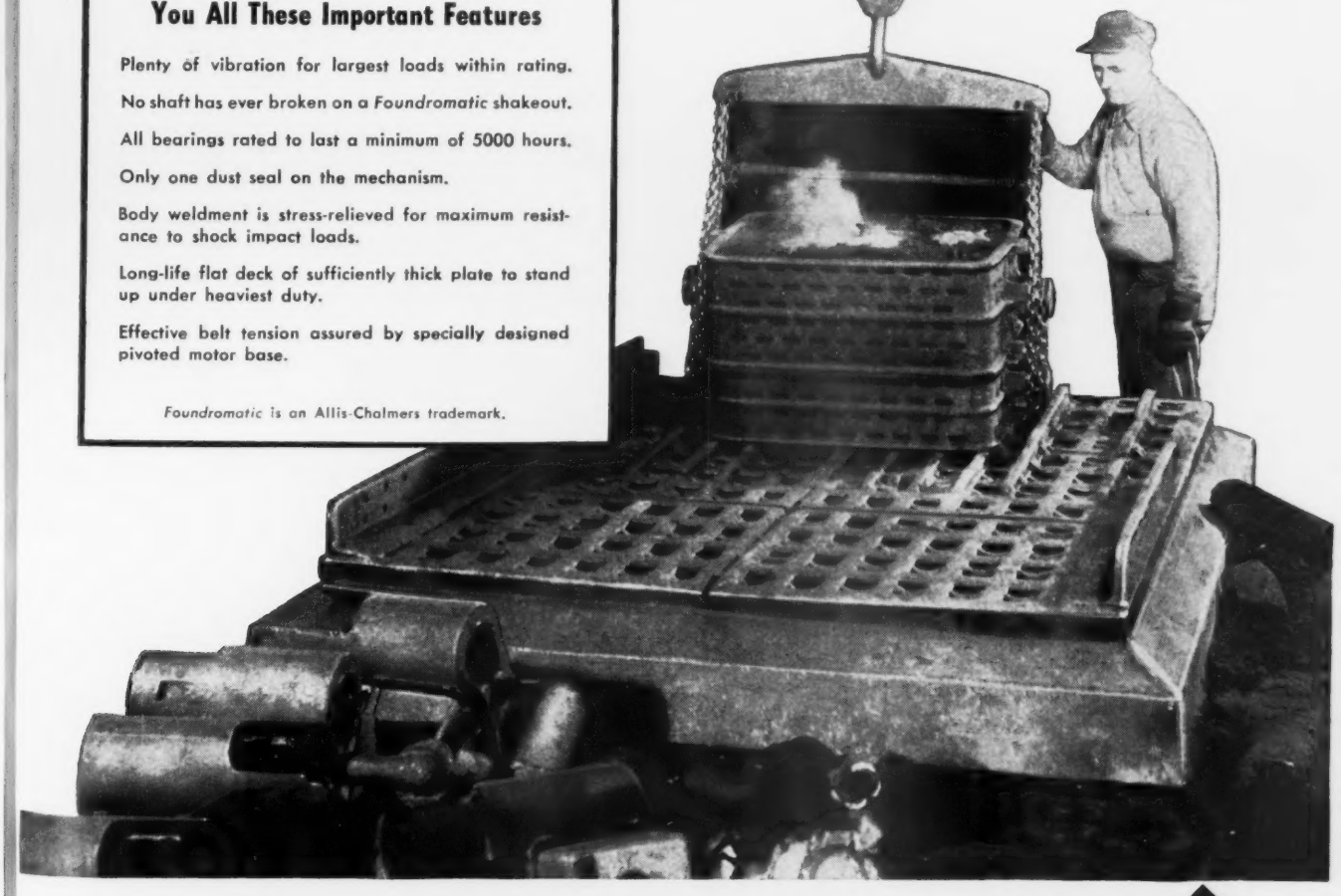

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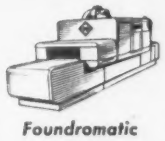
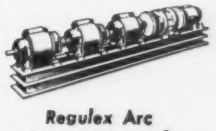


Foundromatic Core Dryer

Induction Heating & Melting



Regulex Arc Furnace Control

no other method of sand preparation can give you such uniform, thoroughly SATISFACTORY RESULTS!

For easier, more economical sand preparation, and better castings, use Crown Hill Seacoal, Federal Green Bond and Federal Sand Stabilizer as your sand additives.

If yours is an iron foundry and you are still searching for additives to provide the sand characteristics needed for your work—without requiring special sand or exacting sand control—you can stop searching! Do what hundreds of iron foundries do—use Seacoal, Bentonite and Sand Stabilizer.

Each of these materials has to do with distinct elements of sand preparation, so their use in varying amounts makes it possible to easily control all the important sand characteristics and to change them to satisfy specific requirements. By adding the proper amount of Seacoal, carbon content can be controlled at will and changed to suit the job. Through the use of Bentonite, green and dry strength of the sand can be varied as required. Adding Sand Stabilizer provides control of flowability, so molds can be rammed to proper hardness with a minimum of time and effort.

Special or fine grades of sand are unnecessary. Common lake, river or beach sand is often used for heap or system replacement. And there's no danger of sand grain size being thrown out of balance—as happens when offals of cores made of coarse sand, mix in with the fines necessarily used with emulsified asphalt or resin additives.

Yes, you'll get easy sand preparation—better castings—smoother casting finish—less-lumpy shakeouts with Seacoal, Bentonite and Federal Sand Stabilizer. *And these additives will cost you less than $1.00 per ton of castings produced!* A new bulletin tells all about this better method of sand preparation—write for your copy TODAY!

CROWN HILL SEACOAL

Produced by FEDERAL at Crown Hill, West Virginia. *High* in volatile combustible material, *low* in sulphur and ash content—basic requirements for a top quality seacoal. Ground or granulated to properly match the sand used.

FEDERAL GREEN BOND

Mined, processed and guaranteed by FEDERAL and unexcelled in uniformity and ability to develop green and dry strength. Truly the best of the bentonites!

FEDERAL SAND STABILIZER

A processed cellulose sand additive whose high combustibility allows sand to expand evenly to eliminate casting defects. It increases sand flowability to provide better ramming conditions and attracts moisture to broaden the safe moisture range. And it eliminates lumpy shakeout.

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FOUNDRY

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JUNE 1953

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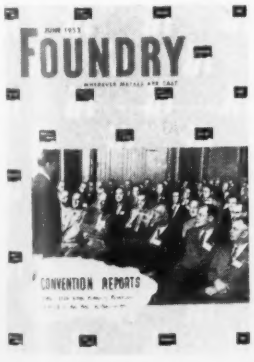
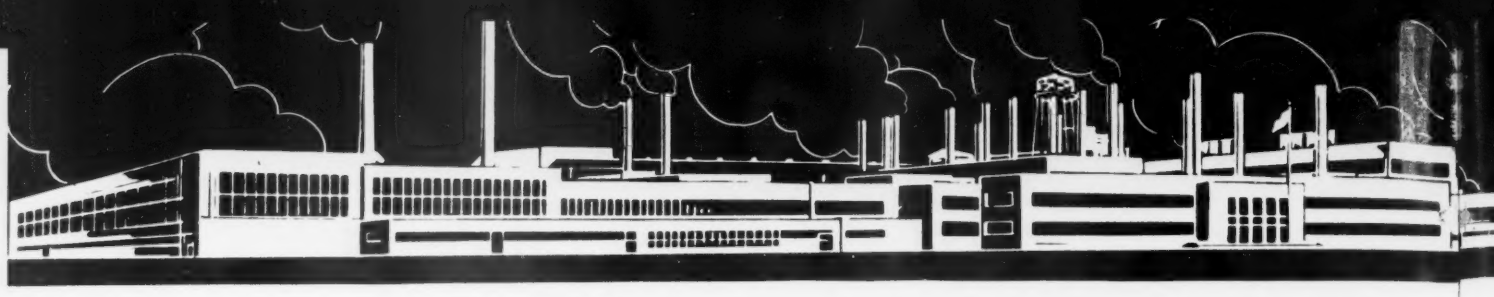
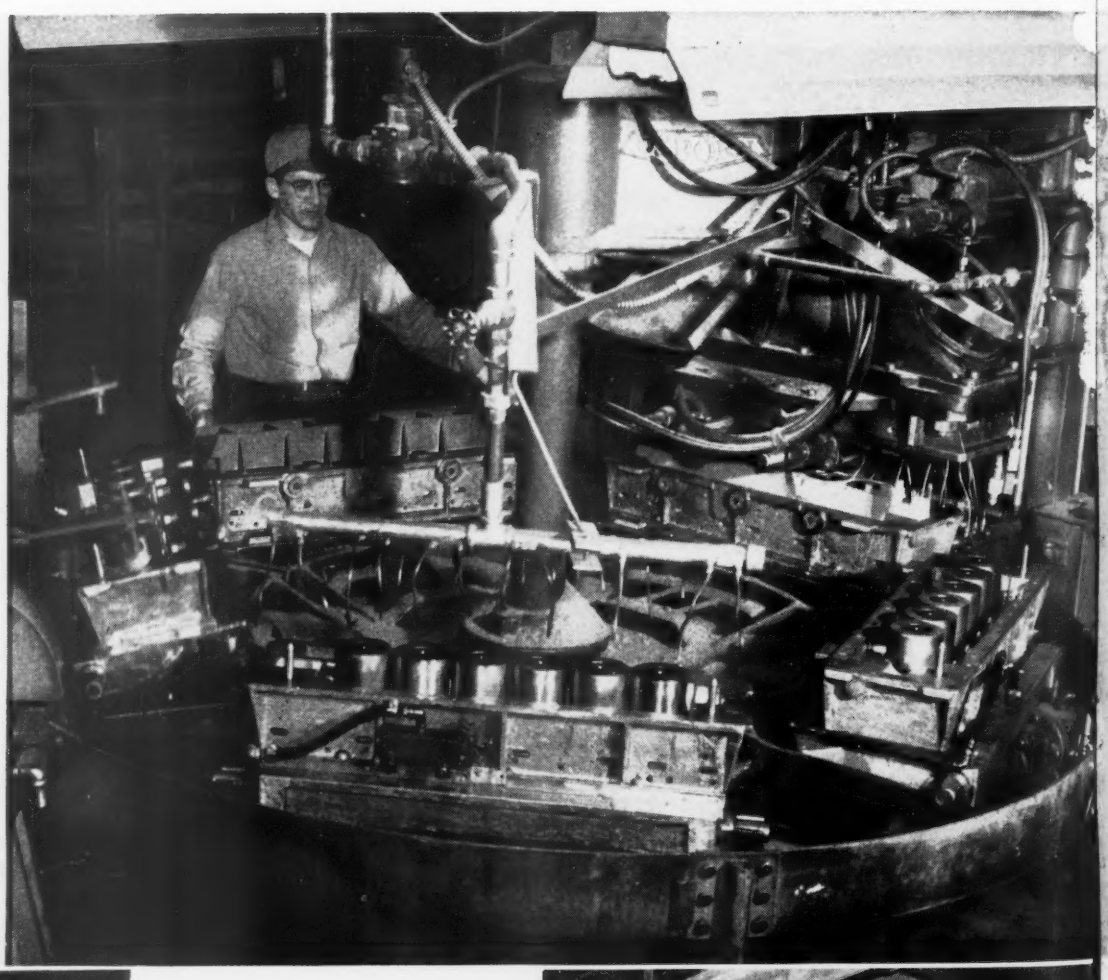


THE COVER: Ray Olson of Production Foundry & Pattern Co., Chicopee, Mass., shown addressing one of the technical sessions at the AFS Chicago convention

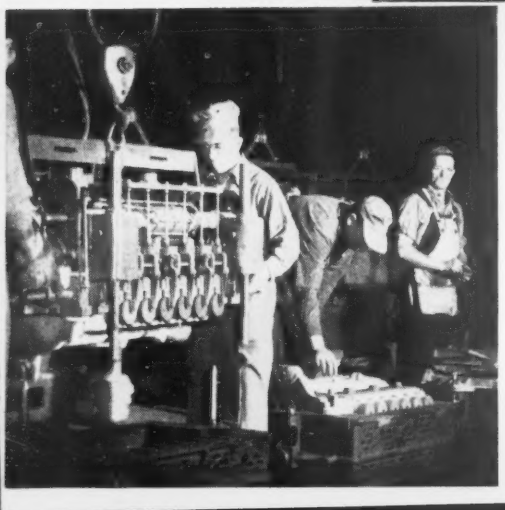


CLEVELAND FORD —

relies on LINOIL —

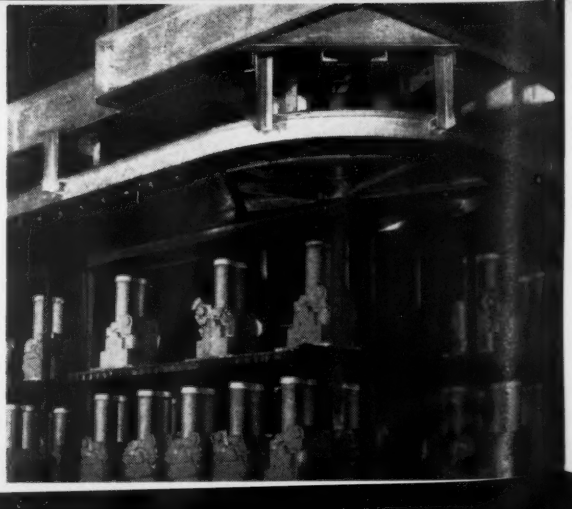


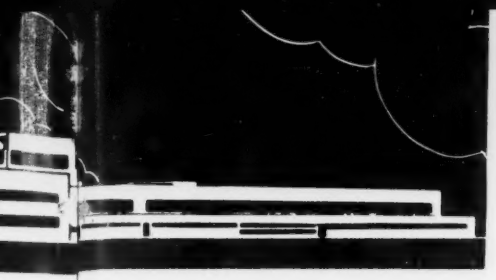
Special high-speed "merry-go-round" core blower automatically blows into five boxes from one blow head, requires only two men to operate.



Overhead conveyors keep cores in continuous motion from blowers to molding floor. Barrel and body cores, here, are entering baking ovens.

Cores are assembled in special jig and set into molds prior to pouring.





one of America's largest production foundries

most widely-used core oil in America

● For every ton of castings, the new Ford Foundry in Cleveland, Ohio, produces about a ton of cores . . . some made at the rate of 340 per hour!

Anticipating this phenomenal production, plant engineers designed the most modern, efficient core room imaginable . . . incorporating the knowledge gained in Ford's fifty years of foundry experience.

To assure high-quality cores, production is fully controlled by automatic equipment . . . push-button mixing, pneumatic sand conveying system, high-speed blowing machines, conveyorized handling throughout, and numerous other mechanized controls and devices.

To further assure top quality in cores ranging from lacey water jackets to heavy chunks, the Cleveland Ford Foundry selected LINOIL, the most widely-used core oil in America.

1. **LINOIL** is versatile . . . good for all sizes of cores
2. **LINOIL** is uniform . . . every batch gets 3-way check
3. **LINOIL** is adapted to high-speed equipment . . free-working characteristics prevent clogging of pneumatic equipment
4. **LINOIL** is economical . . . more strength per cent of cost
5. **LINOIL** arrives on time . . . strategically-located plants and warehouses assure overnight delivery —anywhere in U. S. A.

These are a few of the reasons why so many foundries, large and small, rely on LINOIL for quality cores. Your ADM representative can demonstrate LINOIL benefits right in your core room. Give him a call, or write direct to address below.

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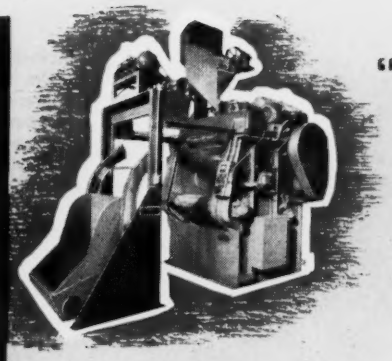
producers of **LINOIL** **INDUCTOL** **FREFLO** **LIN-O-CEL**

PANGBORN BLA
CUTS LABOR C

BOTH AGREE: Foundry Superintendent Arnold Salg and Foreman Leroy Patterson agree: "The kind of cleaning we get with the new Blastmaster fits right in with our ideas on quality—and quality is mighty important here at Gisholt!"

...TMASTER BARREL ...CTS 33⅓%



"Doing a quality cleaning job" for Gisholt Machine Co.

When the Gisholt Machine Co., Madison, Wis. installed a Pangborn Blastmaster ROTOBLAST® Barrel, Gisholt's primary concern was quality. On that score, the Blastmaster came through with flying colors.

But in addition to the fine cleaning job it does, Pangborn Blastmaster has slashed labor costs 33⅓%! And, as if this tremendous saving weren't enough, electrical costs have dropped way down. The Blastmaster uses only 23 H.P. as compared with 54 H.P. originally required—and the Blastmaster cleans faster, so the power consumption is less. What's more, the compact design of the Barrel frees over 200 sq. ft. of floor space required by former cleaning equipment.

The operation of the Blastmaster at Gisholt is typical of Blastmaster installations all over the country. If *you* are interested in better, faster cleaning . . . in *cheaper* cleaning . . . it will pay you to investigate the Pangborn Blastmaster Barrel. Available in 4 sizes—3, 6, 12, or 18 cu. ft. capacities. For more details, write for Bulletin 223 to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Maryland.

OVER 28,000 PANGBORN MACHINES SERVING INDUSTRY

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

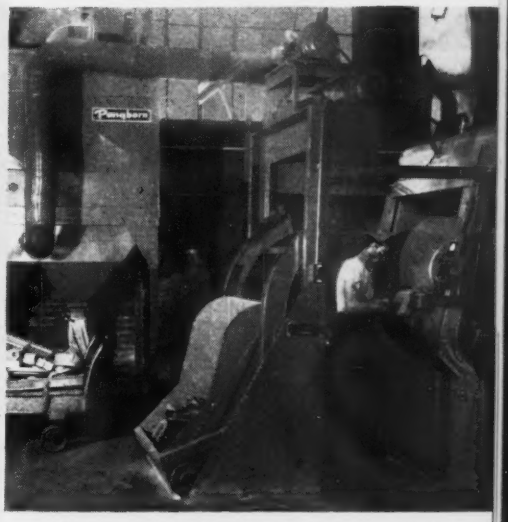
Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

Blastmaster's convenient push-button panel eliminates many of the time-consuming steps in the cleaning operation.

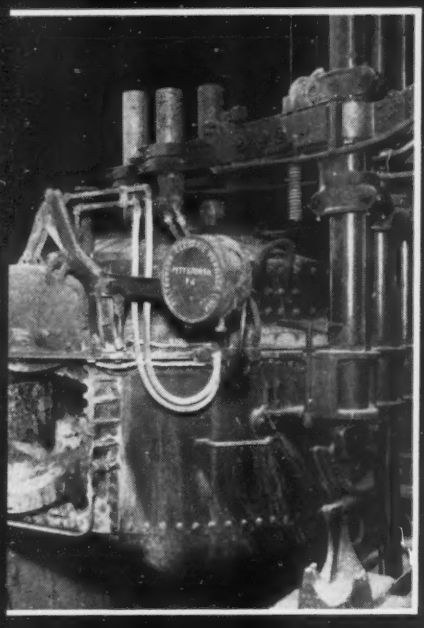


Side view of Blastmaster shows simple, automatic loader. Pangborn Dust Collector in background serves the blast barrel.

Close-up shows the operator Peter Scallasi reversing work conveyor for easy unloading of cleaned castings.

Two OPT Lectromelt Furnaces work constantly at AMSCO Division, Chicago Heights, Illinois.

At New Castle, Delaware, AMSCO Division, a Type Q Lectromelt Furnace.



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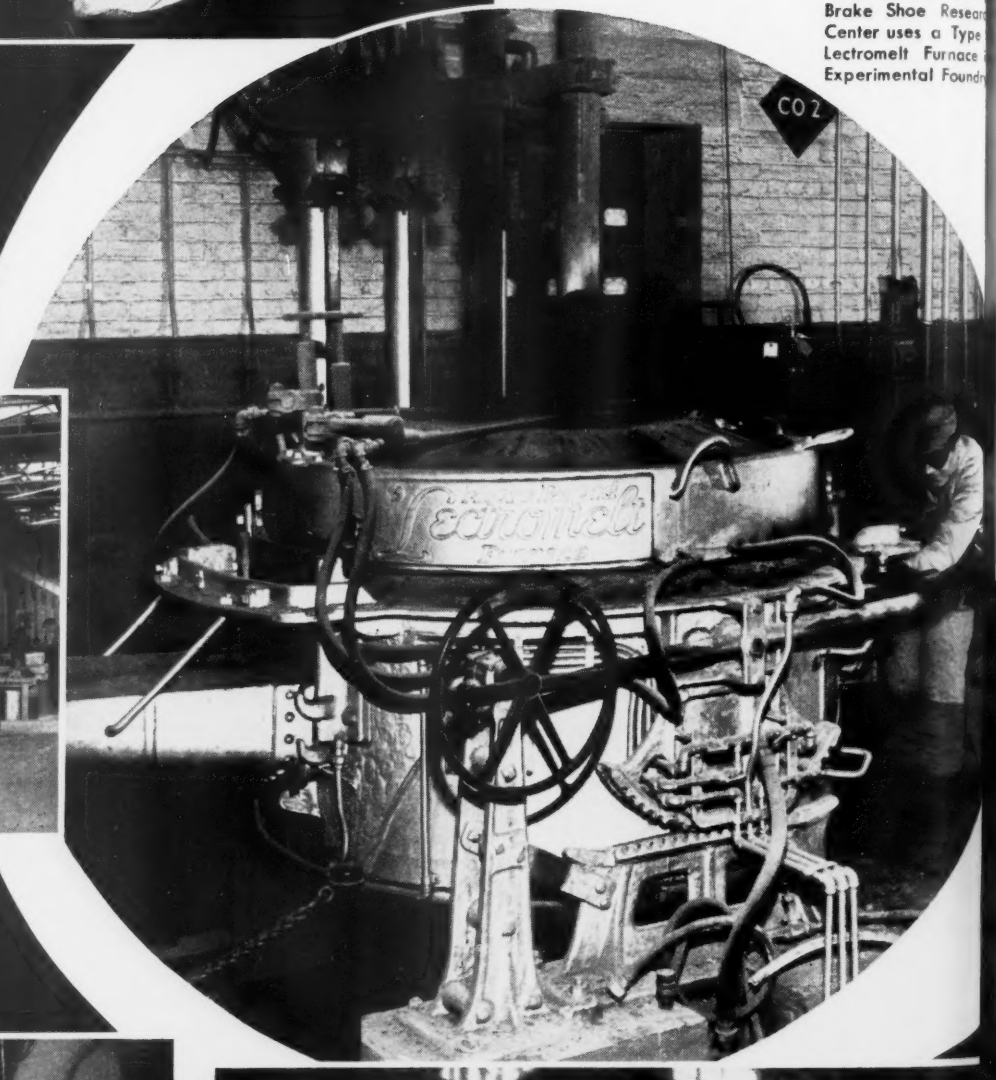
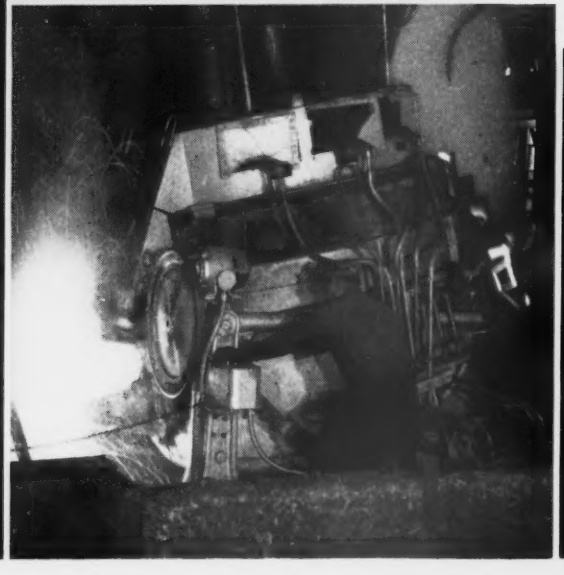
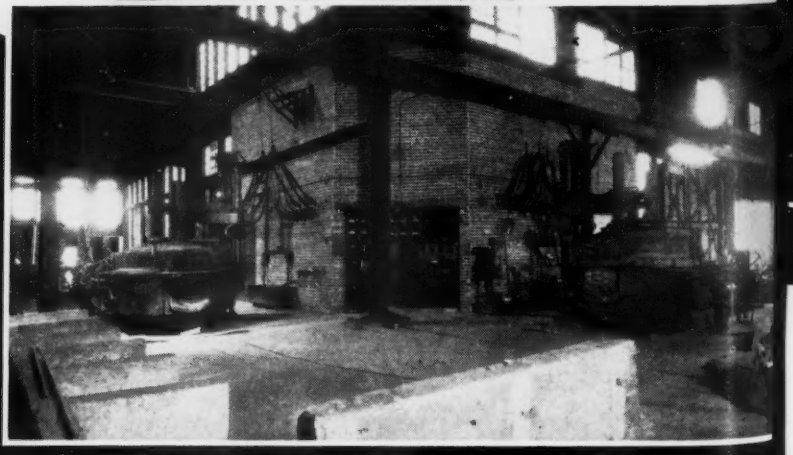
Mahwah, New Jerse
Brake Shoe Resear
Center uses a Type
Lectromelt Furnace
Experimental Foundr



Electro-Alloys Division at Elyria, Ohio uses three Lectromelt Furnaces: Types QT, ST and TT.

The AMSCO plant at St. Louis uses two Type Q Lectromelt Furnaces.





There are three Type Q Lectromelt Furnaces in the Denver, Colorado, AMSCO Division.

AMERICAN BRAKE SHOE

high grade production

Depend on Lectromelt* Furnaces for research and production

American Brake Shoe tests and proves metal formulae and casting procedures in the Experimental Foundry at their Research Center at Mahwah, N. J. A new cupola, in combination with a two-ton Lectromelt Furnace, provides the close control required for research . . . plus the capacity to test accepted new procedures under actual conditions of production.

After establishing efficient methods for new procedures, they're relayed to the company's many divisions. And the high standards set in the Research Center at Mahwah become the production standards at the plants.

Indicative of the confidence American Brake Shoe places in Lectromelt Furnaces is the extensive use of them in various divisions, as indicated on these pages.

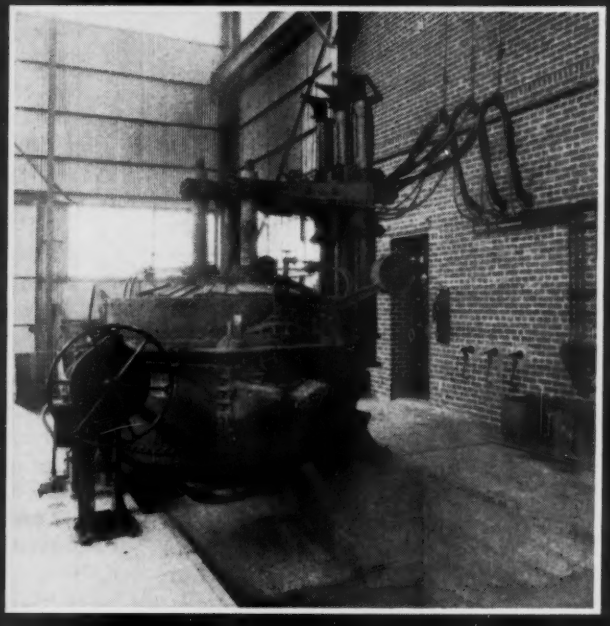
For Catalog No. 8, describing the advantages of Lectromelt Furnaces, write: Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pennsylvania.

*Reg. U. S. Pat. Off.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

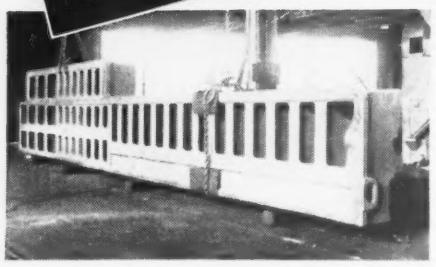
Even in Canada at Joliette, Quebec, it's Lectromelt; one Type Q and a CQT.

At Los Angeles, the AMSCO Division has three Lectromelt Furnaces: two Type Q's and an S.

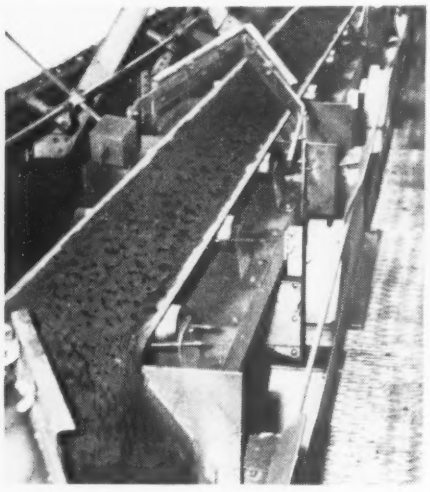


WHEN YOU MELT... MOORE RAPID *Lectromelt*

Imperial Belting helped make this 30-ton casting



■ This giant roll grinder bed casting, made by Landis Tool Co., Waynesboro, Pa., is more than 43 feet long and weighs 59,790 pounds. Large quantities of synthetic sand at temperatures up to 500 F.° were required in its production. Imperial heat-resisting conveyor and elevator belts performed this vital moving job efficiently and economically —and without breakdowns, delays or other trouble.



Job-Designed for You

Imperial Standard Sahara withstands temperatures up to 300°F.; Insulated Sahara up to 450°F. Super Insulated Sahara is recommended for temperatures through 600°F. Whatever your own belting needs may be, Imperial can provide job-designed belting that is unequalled for dependability, long life and operating economy.

Write us for further information.

Imperial
BELTING CO.
1755 S. Kilbourn Ave., Chicago 23, Ill.

With the Editors

CONVENTION Recollections: An excellent annual technical meeting . . . record-breaking attendance . . . the catacombs of the Sherman Hotel lobby . . . wide interest in plant visitations . . . crowded elevators . . . overflow crowds at shell molding sessions . . . excellent handling of AFS medal and life membership presentations by Fred Walls . . . recurring suggestions of new developments such as the "D" process and pressure casting . . . a superb lecture by James H. Smith, the 1953 Charles Edgar Hoyt lecturer . . . final acceptance of the society's building plans . . . the exceptional report by Hy Bornstein on Israel and its industry . . . Bob Kennedy, John Grennan and the old timers' registration . . . badges . . . people . . . talking . . . Cleveland in 1954.

—o—

Thirty Years: The 1953 Chicago meeting of the AFS marked a thirtieth anniversary, because it was in 1923 that I attended my first convention of the then AFA. The affair, including a large exhibit of foundry equipment and supplies, was staged in the recently completed Public Hall at Cleveland. Needless to say, I was greatly impressed, although my time available for visiting the exhibition was indeed short. FOUNDRY published a 16-page daily paper on four days of the convention, giving news of the technical meetings and the show and carrying a complete convention daily registration list.

It was quite a job, and I was assigned to the night shift that put the paper to bed—in the wee small hours. But one morning I got over to the hall and stood in line at the registration desk. A kindly gentleman in front introduced himself; he turned out to be Herbert S. Simpson of National Engineering Co. He told me a lot about the convention and the show as we waited in line. Dr. Gulliam H. Clamer of Ajax Metal Co., Philadelphia, was elected president.

—o—

A Prophet: In thinking about this early convention in my journalistic career, I got down the bound volume of FOUNDRY for 1923 and looked over the report of the meeting. Was particularly intrigued with the following passage from the annual address by President Messinger:

"With the growth of the industry in certain centers, local foundrymen's associations are being organized, and the fact that foundrymen are getting together locally is an indication that closer relationship is needed between our association and its individual members. Any movement which draws foundrymen together cannot be looked upon with disfavor by us and yet anyone with vision, no matter how great his interests may be in a local organization, cannot but see the value of a strong national association. I am confident that a plan of local sections can be worked out that will benefit both the American Foundrymen's Association and the local organization.

"A definite plan has not as yet been crystallized, but it has been suggested that sections could be organized by us and that membership in the American Foundrymen's Association would constitute membership in the local. Funds could be allotted to locals according to their activity and the number of members."

It took 11 years to get this chapter movement under way. And now look what has happened.

—o—

Change: While I certainly have joined the Old Timers' Club of convention attenders, the 1953 meeting was the first for Assistant Editor Jack Miske. Just think of the tremendous changes that he will observe in the industry and conventions when he attends the annual meeting in 1983.

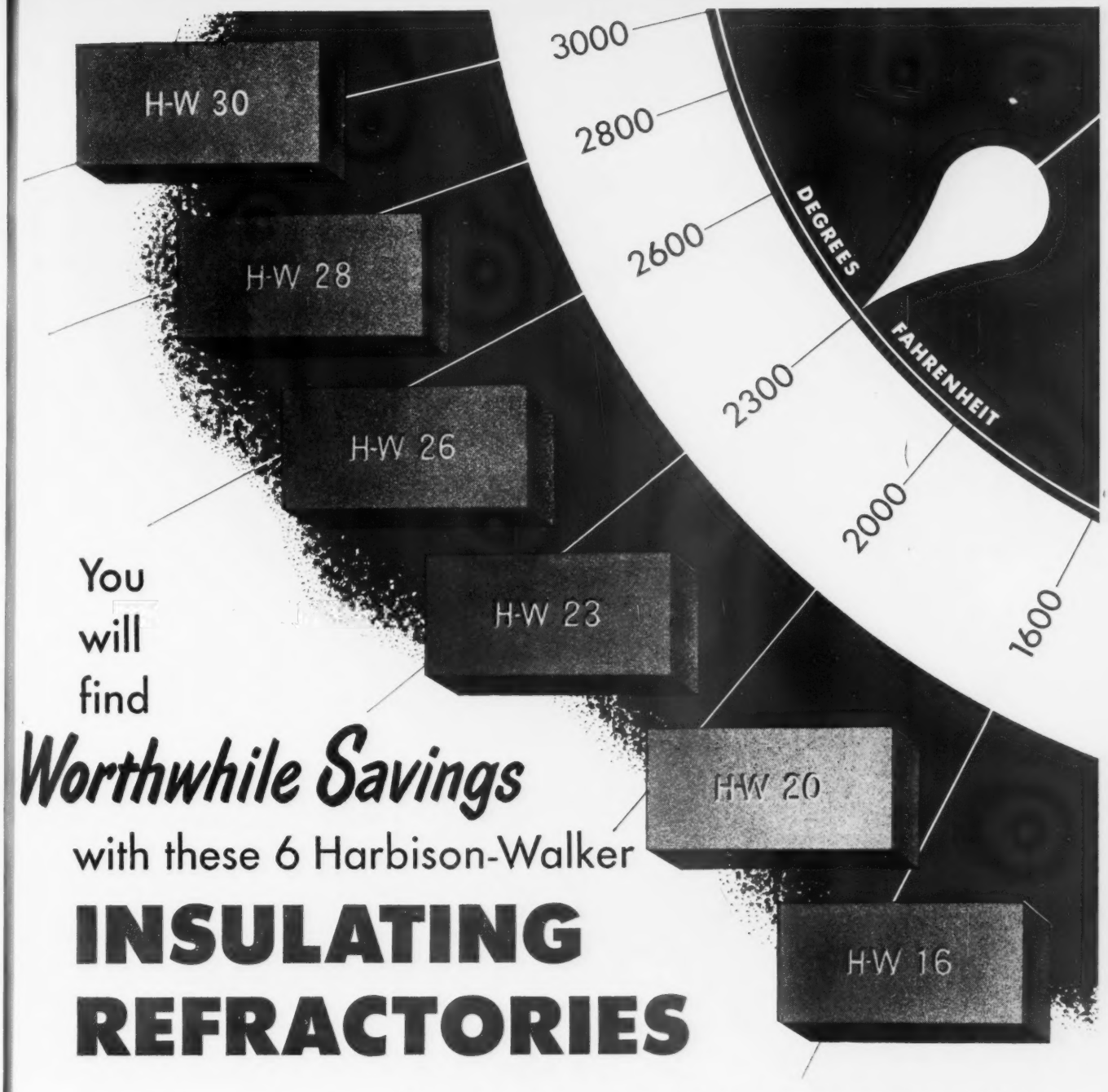
—o—

Thanks: Most of the photographs of the convention reproduced in this issue were taken by Art Allen of Allen, Gordon, Schroeppel & Redlich Inc., Chicago. The photograph of the banquet, alumni dinner and the annual dinner of the Non-Ferrous Founders' Society were made by Flash Foto Co., Chicago. The editors thank these two organizations for their excellent cooperation.

—o—

Rough Castings: Foundrymen attending the Malleable Marketing Conference at the Illinois Institute of Technology were startled at the following headline on the campus paper, *Technology News:* "Ribald Humor Keynote of Rough Castings Play." Of course you have surmised that this "Rough Castings" refers to a

(*Concluded on page* 12)



You will find

Worthwhile Savings

with these 6 Harbison-Walker

INSULATING REFRACTORIES

The balanced properties of Harbison-Walker Insulating Brick mean superior performance and dependable service. Light weight, essential to high insulating value and low heat storage, has been attained to the greatest degree consistent with the good mechanical strength necessary for handling and for many furnace structures.

Available in six classes, suitable for service in the temperature ranges indicated above, Harbison-Walker Insulating Brick reduce heat losses, save space, absorb noise, conserve fuel.

H-W 85 and H-W 56 CASTABLES are widely used to great advantage in monolithic structures for refractory insulation.

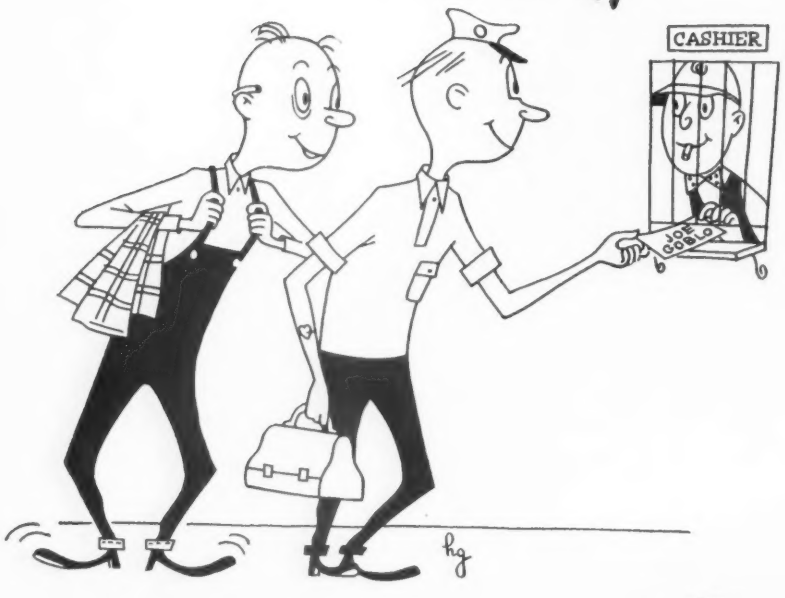
We will gladly send you bulletins containing data and descriptive information about Harbison-Walker Insulating Brick and Insulating Castables.

Harbison-Walker Engineering Service will help you with the selection of the insulating refractories best suited for your requirements.

®

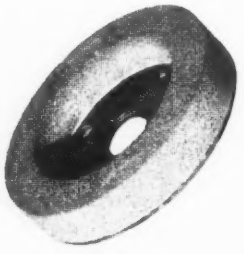
HARBISON-WALKER REFRACTORIES COMPANY
AND SUBSIDIARIES
World's Largest Producer of Refractories
GENERAL OFFICES **PITTSBURGH 22, PENNSYLVANIA**

They're "pay-off" wheels for the grinding department!



SIMONDS ABRASIVE CO.

Grinding Wheels



Better output . . . bigger "take-home"! That's the "cause-and-effect" performance of Simond's wheels! *Everything* that goes into their making . . . materials, engineering skill, accuracy of specifications . . . assures you of wheels that withstand the test of production grinding, give micro-inch finishes, fast stock removal, cool sharpening and superior polishing. Complete line has everything you need.

Write for data book and name of your nearest distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co, Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(*Concluded from page* 10)

theatrical group at Tech, and not to the metal at the foundry shakeout. The footnote to the newspaper story was quite interesting: (The show is written for a mixed crowd, but they must be liberal minded.) Sounds like an apt description of most modern plays.

—o—

Viewing with Alarm: The following sentence was part of an interesting editorial in the Apr. 6 issue of the *Wall Street Journal:* "It was much easier to write editorials for these columns when Mr. Truman was thrashing about at a great rate than it has been since a greater degree of calm took hold of Washington." To all this we can say "Amen."

—o—

Experts: It looks like the battle of the experts is well under way. The following AP dispatch certainly shows that Russia is going to be as generous with its foundry know-how as we have been in recent years:

SOVIET TEAM IN PRAGUE

Foundry, Steel Experts to Pep Up Czech Production

Vienna, Austria, April 16—(AP) — Lieut. Gen. Vyacheslav A. Malyshev, Societ minister of transport and heavy machinery, has arrived in Czechoslovakia with a group of Russian foundry experts, Prague radio reported today.

Observers in Vienna believe that shortcomings in Czechoslovakia's foundry and steel industry may have caused the Kremlin to send its top experts to Prague.

Old timers will remember that in the twenties and thirties, foundrymen visiting Europe brought back stories of the Skoda Works at Pilsen and the interesting foundry work being done there. All of which causes us to wonder how the Russian "experts" can help the Czechs.

—o—

The Firemen: Get ready, boys, they may need us! The following advertisement recently appeared in the *Washington Daily News:*

PRESENT OR FORMER EMPLOYES OF EMERGENCY CONTROLS AGENCIES

You are eligible to be an associate member of this Institute. Purpose: To prevent loss of "know-how" of emergency controls; to further develop methods, and to assist such members to maintain mutual contact. Apply by letter stating positions held in emergency controls and in which divisions of which agencies. Annual dues $5 (by check only). Limited to GS-7 and over.

EMERGENCY CONTROLS RESEARCH INSTITUTE

Could it be the gang might want to urge return of controls?

—o—

Some Appreciate: We recently received some requested data from a subscriber in Denmark and he made this comment: "Kind regards and many thanks for all your help—given by Uncle Sam to the Old World." This is quite in contrast to some reports that are received regarding our financial and material help abroad.

F.G.S.

YOU CAN BE SURE OF QUALITY WITH ARROW

Because they are made by the foremost producer of pneumatic tools especially for FOUNDRY cleaning operations. Check the important Arrow features listed below and then judge for yourself:

STEEL USED... Only the finest grade of Silico Manganese tool steel is used in making Arrow foundry tools.

MACHINED SHANKS... To eliminate the costly shank breakage caused by the obsolete forging method, all Arrow pneumatic tool shanks are machined and centerless ground.

FORGING POINTS... Highly skilled hammermen forge the points on Arrow tools at the correct forging temperature for best results.

HEAT TREATMENT... Only controlled atmosphere furnaces are used in this operation. Shanks on chisels and blanks are hardened to 47-50 Rockwell "C" and chisel points to 57-60 Rockwell "C".

PROMPT SERVICE... Adequate stocks of standard tools are maintained to insure quick delivery when you need them.

Write today for Bulletin No. 511 — Foundry Tools.

ARROW TOOLS

INCORPORATED

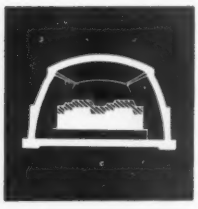
1904 SOUTH KOSTNER AVENUE • CHICAGO 23, ILLINOIS

Telephone CRawford 7-4116

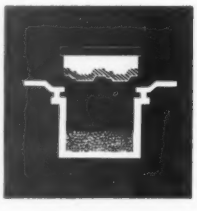
NEW general-purpose shell

gives greater latitude

Bakelite Company announces the development of a new general-purpose shell molding resin that *can be subjected to a greater variation in operating conditions than ordinary shell molding resins.*

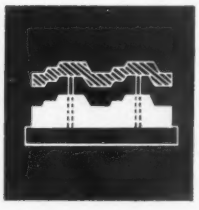


Shell molds bonded with this resin reach minimum usable strength in the curing operation faster than molds made with ordinary resins. They also retain their strength for longer periods at curing temperatures, permitting greater leeway in curing time.



This new BAKELITE phenolic resin reduces the tendency of the resin-sand mixture to fall off the pattern plate during the inverting operation.

Shell molds made with this new resin resist the tendency to distort upon ejection from the hot pattern plate, insuring better mating of mold halves. This hot rigidity is obtained without sacrificing toughness and provides molds that are more dimensionally stable, and which resist deformation during the pouring operation.

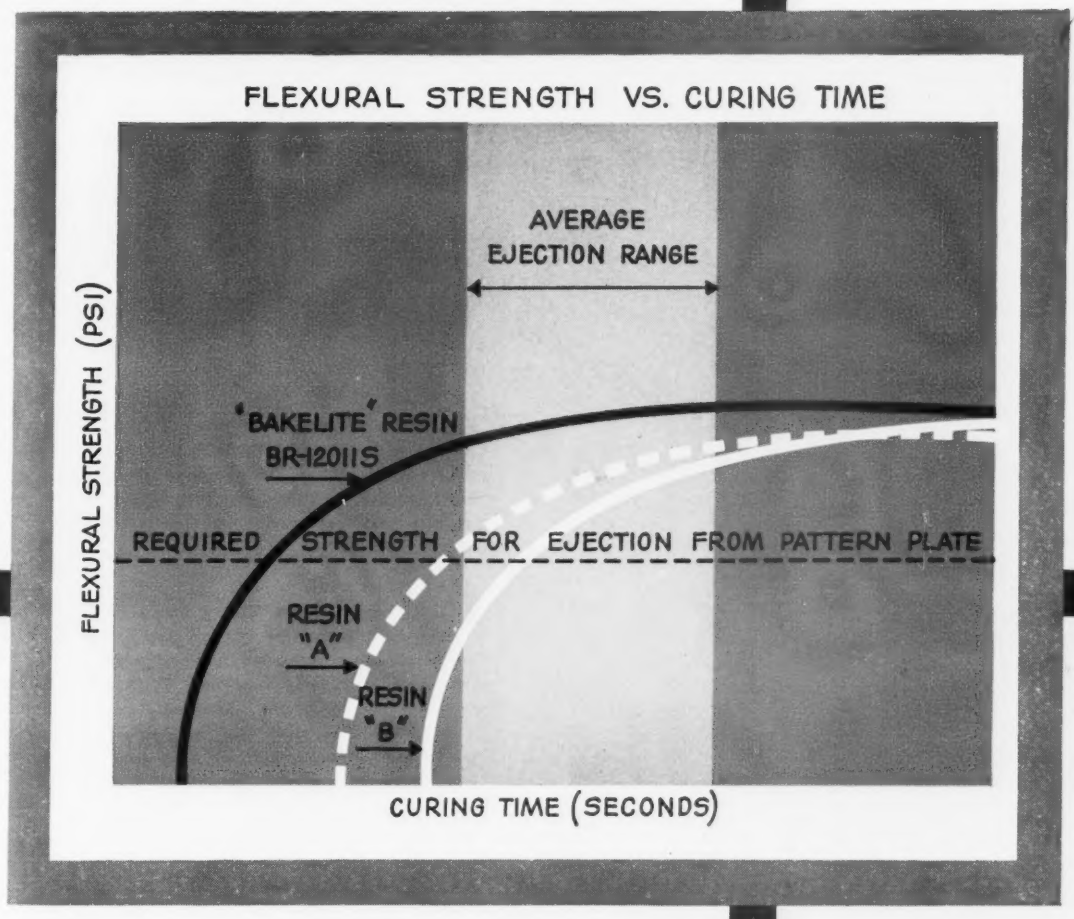


Field and laboratory tests of molds made with BAKELITE phenolic resins reveal a direct correlation between resin particle size and mold strength. In common with other BAKELITE phenolic shell molding resins, the new resin is finely ground, and is uniform both as to particle size and batch-to-batch production. The fine uniform particles give greater coverage per pound of resin. Smaller quantities of resin are needed to reach minimum usable strength, with resulting economies. This uniformity also eliminates the need for foundrymen to make extensive adjustments in formulation during production operations.

For further information on this new BAKELITE phenolic resin, write Dept. QI-29, presenting your requirements in detail for accurate and prompt evaluation.

molding resin

in mold-making



BAKELITE Resin BR-12011S is resistant to distortion upon ejection from the hot pattern plate because of its high flexural strength when hot. Shell molds produced with this material will reach a minimum usable strength faster than ordinary shell molding resins, and will retain a strength in excess of this minimum for longer periods while still at curing temperatures.

BAKELITE
TRADE-MARK
RESINS FOR SHELL MOLDING

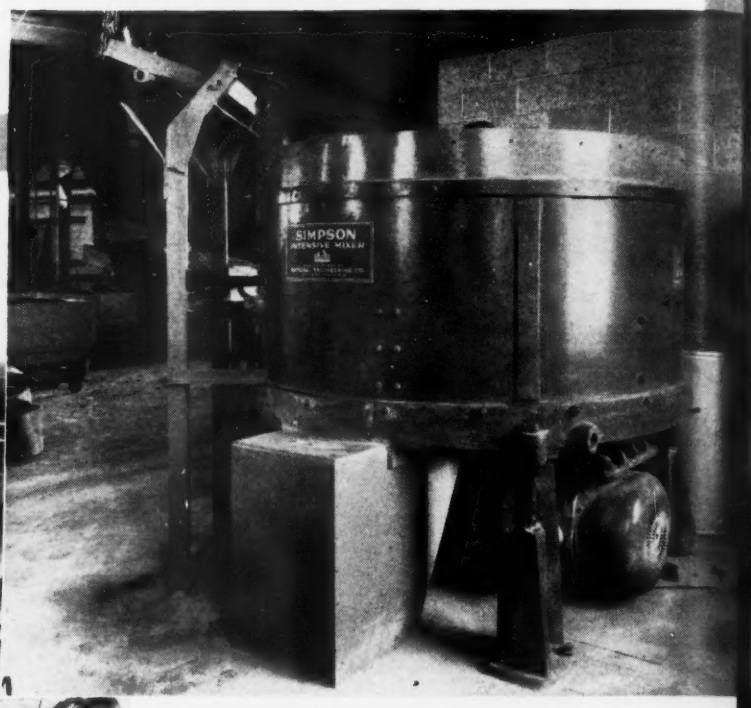
TRADE MARK

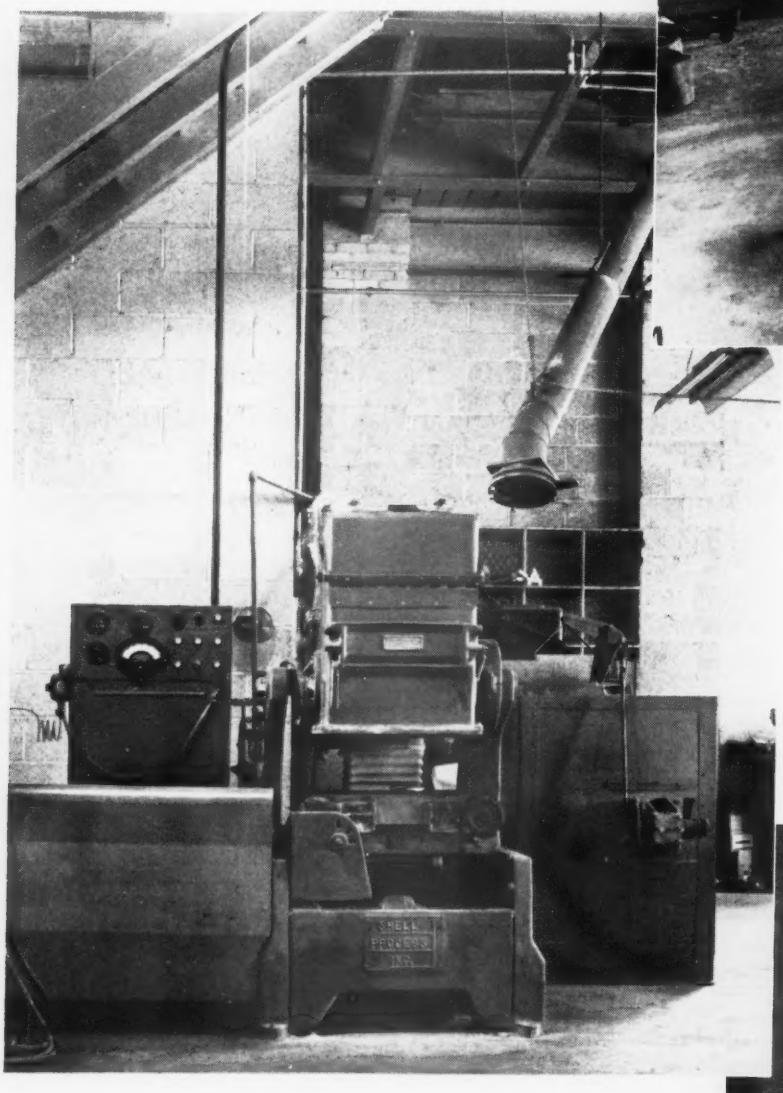
BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.
In Canada:
Bakelite Company (Canada) Ltd., Belleville, Ont.

"SIMPSON MIX-MULLER does the job best in mulling sand and resin for SHELL MOLDING"

...says

EARL W. JAHN, *President*,
PRODUCTION PATTERN & FOUNDRY COMPANY





▲ Above: View of Number 2 Simpson Mix-Muller located at Production Pattern and Foundry Company in Chicopee, Mass. It properly prepares sand and resins for use with shell molding equipment to produce castings with extremely high surface finish and very close tolerance.

◀ Left: View of one of the automatic shell molding machines at Production Pattern and Foundry Company. Prepared sand from the Simpson Mix-Muller is fed into either of several machines by the chute shown at top right of the photo. This machine, originally developed for their own use, has proven so successful that it is now manufactured and sold through a division of the company—Shell Process Inc.

▶ Right: Close up of chute being prepared to discharge mulled sand from the Mix-Muller into one of the shell molding machine hoppers. The Simpson Mix-Muller, located on the second floor, delivers the mulled sand to a small accumulating hopper and thence into the chute.

THE Number 2 Simpson Mix-Muller shown at the left is turning out a 1500 lb. batch of mulled sand and resin every 15 minutes for automatic shell molding operations at Production Pattern and Foundry Company, "without generating harmful heat while blending and coating". The president of this up-to-date Chicopee, Massachusetts foundry goes on to say . . . "Previously, we had attempted to use another type of mixer. It did not do the job"!

The mix being prepared in the Simpson Mix-Muller is made up of 6% dry resin and 94% dry lake sand. No moisture is used. The intensive rubbing, smearing action of the Mix-Muller provides a completely uniform blending of materials that proves superior for use in the widely publicized automatic shell molding process. From the very first batch, Production Pattern and Foundry Company obtained uniform and satisfactory results.

This modern foundry is also using Simpson Mix-Mullers in their green sand molding line and in their core room . . . and "future sand, resin mixing practice indicates the continued use of Simpson Mix-Mullers in our operation", says Mr. Jahn, who is also president of Shell Process Inc., manufacturers of the Automatic Shell Mold Machine shown at left center.

Let our experienced engineering staff show you what Simpson Mix-Mullers can do in your foundry. Write today for further information.

◀ Left: Finished shells are clamped together and placed in a pouring box on a roller conveyor. The boxes then proceed to a packing station where ordinary gravel is fed from a hopper above. The flow of gravel into the box is controlled by slide gates.

▶ Right: After packing, the boxes, still on the roller conveyor, proceed to the metal pouring station, remaining on the conveyor until the castings are cool enough to shake out.

National Engineering Company
(Not Inc.)
608 Machinery Hall Bldg. • Chicago 6, Illinois

NATIONAL SAND and MOLD HANDLING EQUIPMENT
NATIONAL SAND RECOVERY SYSTEM

SIMPSON
Intensive
MIX-MULLERS

GREEN-X SUPER DUTY GRAPHITE-TYPE PLASTIC REFRACTORY

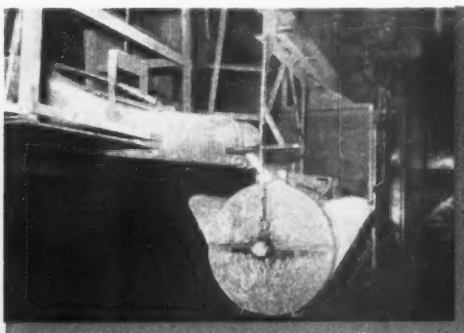
A. P. Green REFRACTORY PRODUCTS

PROVED ON-THE-JOB TO GIVE YOU 6 ADVANTAGES

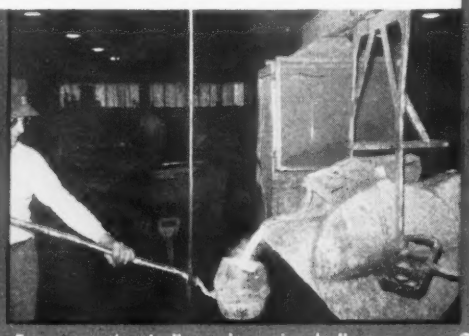
1. More tonnage per lining . . . made from the finest quality super duty fire clay.
2. Easier cleaning with less damage to the lining . . . less adhesion of slag and skull to the lining.
3. Reduces erosion of molten metal . . . develops strong bond throughout entire thickness.
4. Metals flow more easily through troughs and pouring spouts . . . scientifically incorporated graphite has lubricating effect.
5. Provides cleaner metal and more perfect castings . . . successfully resists the attack of molten metal and slag.
6. Fewer laminations and less tendency toward shrinkage.

GREEN-X—
scientifically developed for long life in lining

- Forehearth or Holding Ladles
- Bull Ladles
- Pouring Ladles
- Hand Ladles
- Cupola Wells
- Cupola Slag Holes
- Malleable Furnace —runners & spouts
- Cupola —runners & spouts



1400-lb. capacity transportation ladle and cupola trough lined with Green-X.



Transportation ladle and pouring ladle are both lined with Green-X for longer life and cleaner metal.

Green-X is pre-sliced and conveniently packaged in 100-lb. waterproof cartons . . . designed for easy handling.

WAREHOUSE STOCKS FOR PROMPT DELIVERY

Look in the classified section of the telephone directory or write direct for the name of the A. P. Green distributor in your locality. He has complete stocks and can make prompt delivery.

A. P. GREEN FIRE BRICK CO.

MEXICO, MISSOURI, U. S. A.

In Canada
A. P. Green Fire Brick Co., Ltd.
Toronto 15, Ontario

DISTRIBUTORS IN THE PRINCIPAL CITIES OF THE WORLD

FOR RUGGED LIFT!

USE STEARNS POWER PACKED LIFTING MAGNETS

Stearns Lifting Magnets have tremendous lifting capacity with built-in stamina to take rough handling.

Ruggedly built, powerful and efficient in operation, Stearns Lifting Magnets are the answer to material handling bottlenecks that waste valuable time and labor. Eliminate slings, straps and other methods of handling.

Simple one-man operation permits fast movement of large quantities of material — at a rock-bottom cost.

Take advantage of Stearns magnetic engineering experience. Use Stearns Lifting Magnets on castings, scrap, pig iron, rails, sprues, gates, etc. Available in bolted or all welded construction. Standard or special sizes to meet your requirements. Write today for complete information.

1015

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

STEARNS MAGNETIC, INC.

662 South 28th Street, Milwaukee 46, Wis.

Foundrymen are particular!

. . . Especially where new developments are involved.

More foundries using Sodium Sesquicarbonate

Swing Increases After Praise by Prominent Metallurgist

SPECIAL — Use of sodium sesquicarbonate as a fluxing agent is becoming common practice in foundries all over the country. Relatively new among foundry fluxes, the material was "catching on" with increasing momentum. But its popularity grew by leaps and bounds when a prominent metallurgist chose it for sulphur removal in some important tests on the production of synthetic pig iron.

But they're sold on

SULTRON® flux

During actual tests, a prominent metallurgist found that in the forehearth, sodium sesquicarbonate cut sulphur below 0.050. Sodium sesquicarbonate is sold to the foundry industry only under the trade name SULTRON.®

Read the results of these tests, published in a recent trade paper article by a prominent metallurgist, and you will see why so many foundries are now using SULTRON® flux, which is sodium sesquicarbonate, or trona, in its natural state.

Commenting on the tests which were conducted during the production of synthetic pig iron, the metallurgist said, "After wide experiment, sodium sesquicarbonate was chosen for sulphur removal; used in its natural state, this material produced less erosion in the forehearth with equal removal properties at less cost."

It's the same success story in foundries all over the country where SULTRON® is now being used.

And remember! Sodium sesquicarbonate, or trona, may be obtained by the foundry industry only from the American Silica Sand Co. under the trade name SULTRON.® Take advantage of the free technical service available to help foundries fit SULTRON® into their own specific operations.

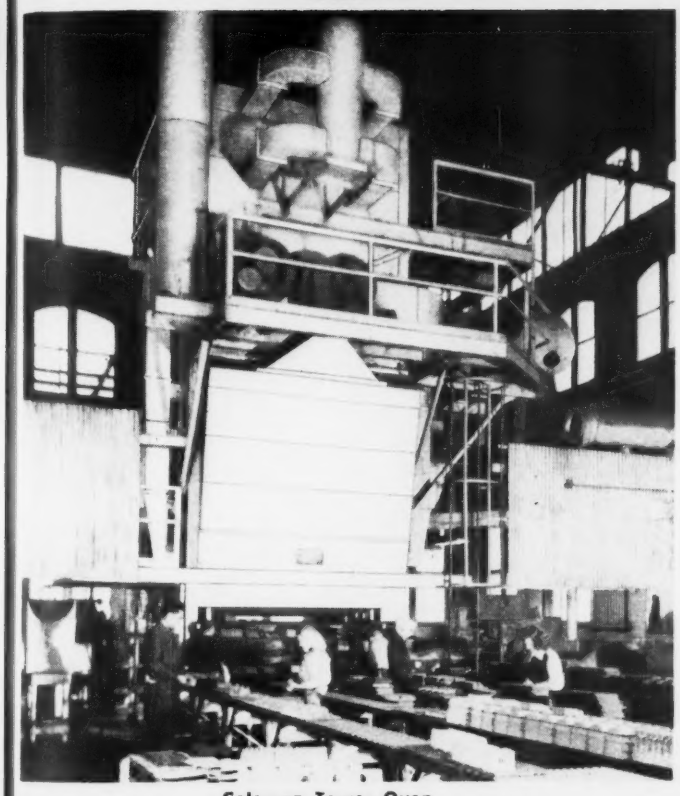
American
Silica Sand Co.
OTTAWA, ILL.

Suppliers of: Crude and dried crude silica sand • *SULTRON*® flux • Australian zircon sand • Zircon flour

®*SULTRON* is the trademark of Westvaco Chemical Division, Food Machinery and Chemical Corporation, for its brand of sodium sesquicarbonate.

Dependability of
COLEMAN OVENS

proved by repeat orders



Coleman Tower Oven
at Eastern Malleable Iron Company

The proper selection of core and mold ovens is vital to profitable casting operation. That's why it's important that you get all the facts about Coleman Ovens and see the performance records that prove their ability to provide substantial savings.

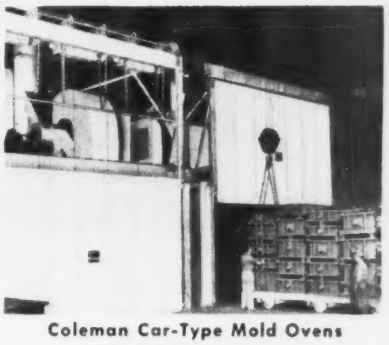
Over 80% of Coleman Ovens are "repeat orders" from customers... conclusive evidence of continuous, dependable performance in foundries of all types. You get over 50 years of know-how and experience in every Coleman Oven, so why gamble with inferior types?

There is a Coleman Core or Mold Oven to meet your requirements whether you have large production runs or small and specialized jobs. Our experienced engineers are available without obligation.

WRITE FOR BULLETIN C

A COMPLETE RANGE OF TYPES AND SIZES
for every core baking and mold drying requirement:
Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers

Coleman Transrack Ovens
at Crucible Steel Castings Co.



Coleman Car-Type Mold Ovens
at Clark Brothers Company

Coleman Car-Type Core Ovens
at Cooper-Bessemer Corporation

THE FOUNDRY EQUIPMENT COMPANY

1831 COLUMBUS ROAD • CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

Hundreds of hours longer...

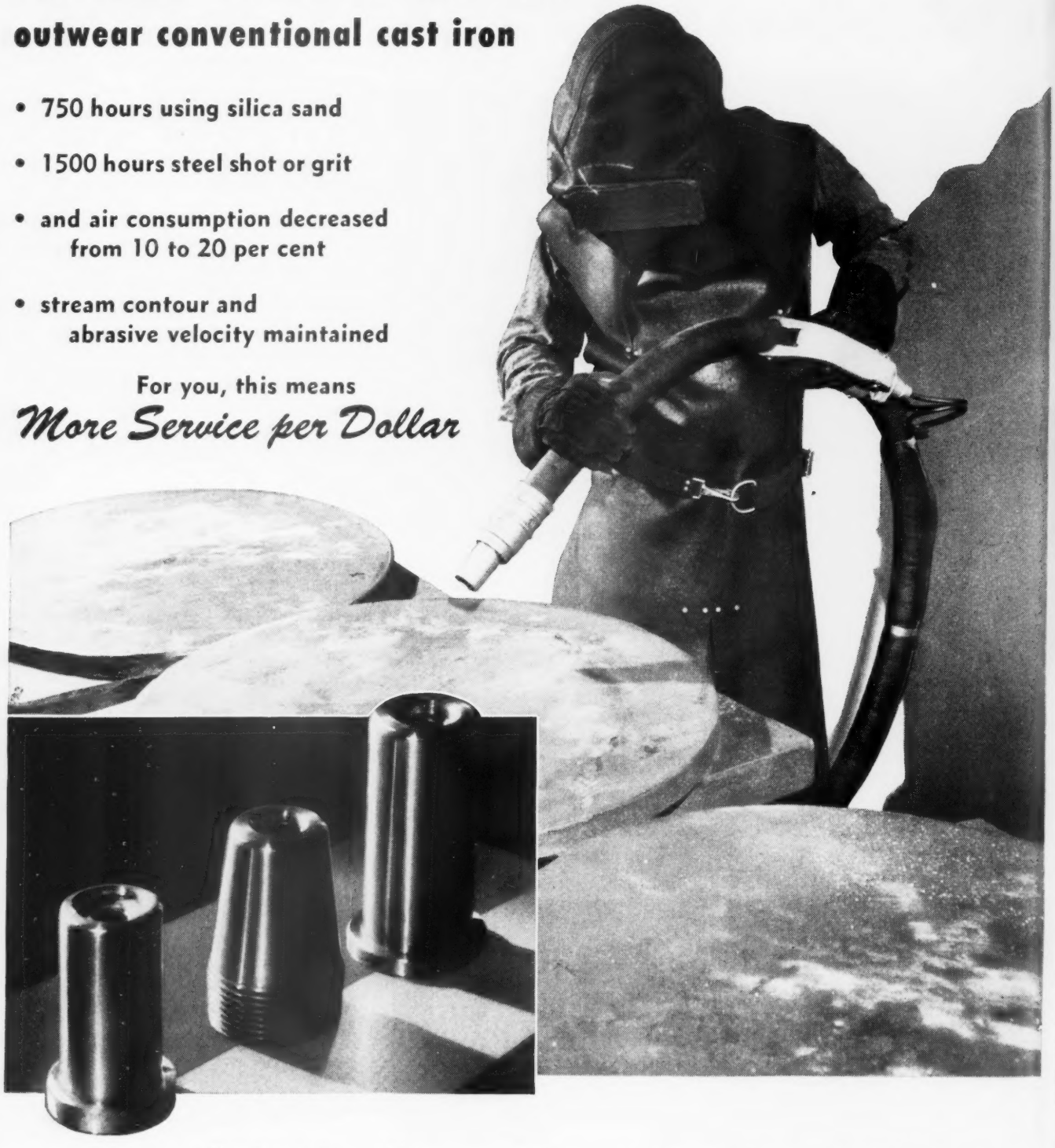
NORBIDE® Pressure Blast Nozzles

outwear conventional cast iron

- 750 hours using silica sand
- 1500 hours steel shot or grit
- and air consumption decreased from 10 to 20 per cent
- stream contour and abrasive velocity maintained

For you, this means

More Service per Dollar



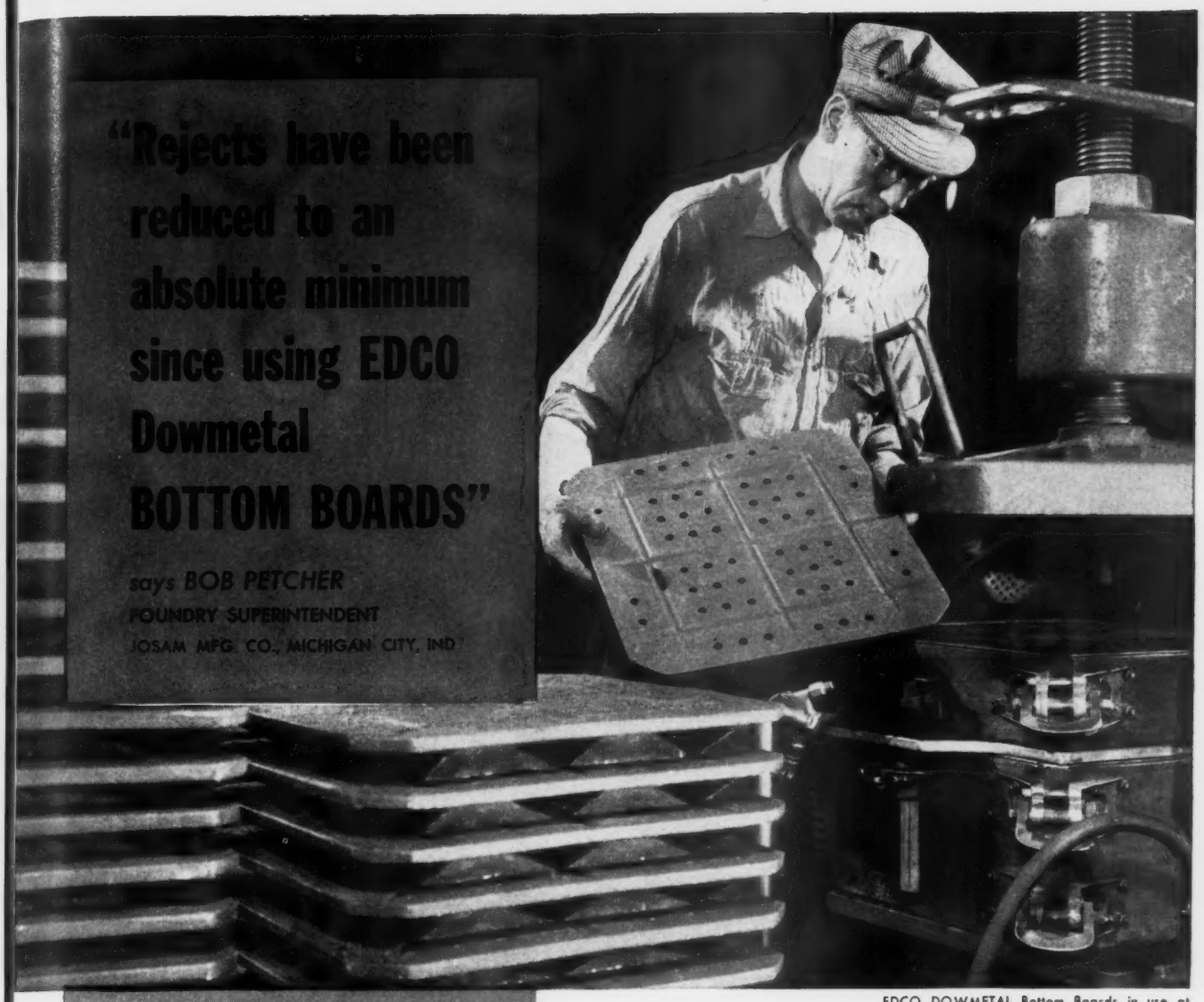
Only the diamond is harder than Norbide

NORTON®

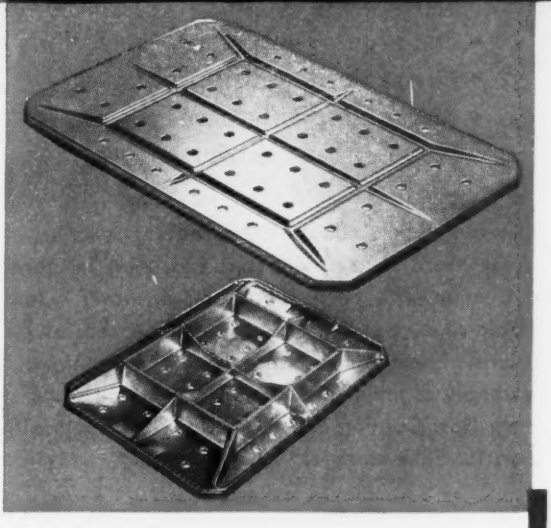
NORTON COMPANY

WORCESTER 6, MASSACHUSETTS

Making better products to make other products better


"Rejects have been reduced to an absolute minimum since using EDCO Dowmetal BOTTOM BOARDS"
says BOB PETCHER
FOUNDRY SUPERINTENDENT
JOSAM MFG. CO., MICHIGAN CITY, IND.

EDCO DOWMETAL Bottom Boards in use at Josam Manufacturing Company, world's largest manufacturer of plumbing drainage products



"Light, easy to handle, practically everlasting, EDCO DOWMETAL Bottom Boards have been a potent factor," says Petcher, "in improving our quality of castings and increasing our output.

"Our old wood boards had a life of about two weeks; and toward the end of their life-span, they always produced some poor castings which had to be rejected.

"EDCO Boards are just the opposite—they are *permanent equipment.* We've been using EDCO DOWMETAL Bottom Boards for more than four years—have used them almost 10,000 times—and they are still in perfect condition.

"These boards have paid for themselves many times over."

You, too, can save time, space and substantial cash sums by using EDCO DOWMETAL Bottom Boards.

They're easy to handle—light. They stack in small space, easily and securely. They last indefinitely—built for it.

Above all, like Josam, you get better castings, fewer rejects—a big saving.

Write us, or phone MAnsfield 6-7330 for price schedule and list of 78 standard sizes available from stock.

CHRISTIANSEN CORPORATION

210 SOUTH MARION ST.
OAK PARK 1, ILLINOIS
ALUMINUM ALLOY INGOTS
MAGNESIUM ALLOY INGOTS

HERE IT IS!

The Most Economical and Efficient Release Agent Available for Shell Molding. . . . . .

FIRST IN SILICONES
DOW CORNING 8 EMULSION
SILICONE RELEASE AGENT FOR RESIN BONDED SAND SHELL MOLDS
NET WT. • LOT NO.
DOW CORNING CORPORATION MIDLAND MICHIGAN, U.S.A.

- ***Effective at lower concentrations***
- ***Gives positive release***
- ***More uniformly accurate shells***
- ***More stable, easier to use***

SPECIFICALLY designed for the shell process, Dow Corning 8 Emulsion costs less; goes further; gives positive release of more uniformly accurate shell molds. This new silicone emulsion containing 35% by weight of a special polymer is more effective at lower concentrations in water. That further reduces costs, and gives even less build-up on patterns. Dimensional accuracy is retained through longer runs; pattern-cleaning costs are substantially reduced.

Dow Corning 8 Emulsion is nonflammable, noncorrosive and highly resistant to creaming or separating in storage or after dilution with either hard or soft water. And it is available at a new low price, 8% below that of previous emulsions. For maximum efficiency at minimum cost, follow the example of major producers of shell molds and specify the new Dow Corning 8 Emulsion. See for yourself! Send coupon for FREE sample.

DOW CORNING CORPORATION, Dept. AH-6
Midland, Mich.

Please send me Free sample of Dow Corning 8 Emulsion
Data on Silicone Release Agents for the Shell Process

Name _____

Company _____

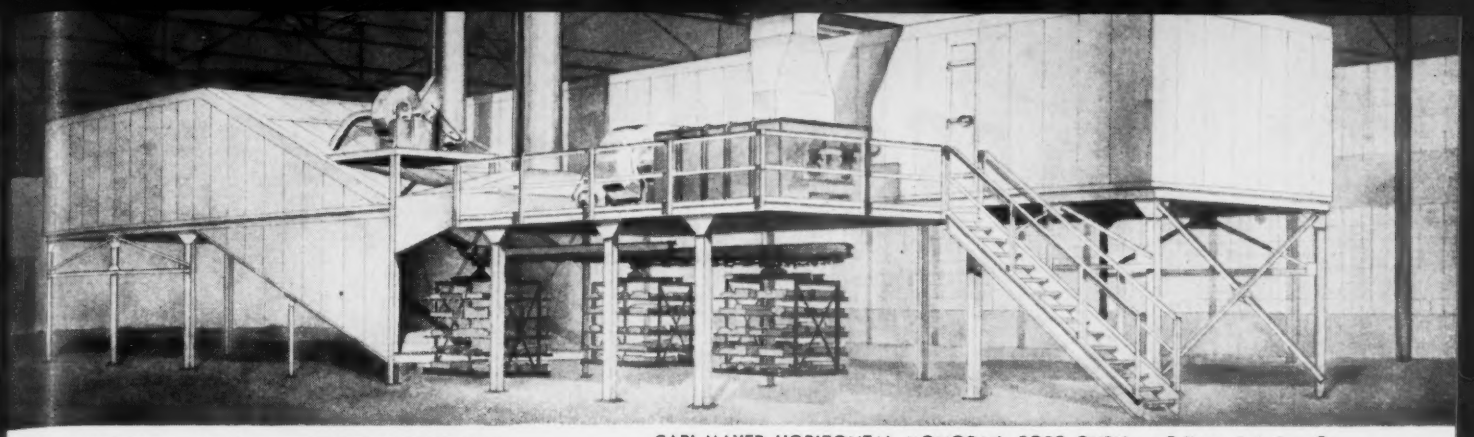
Street _____

City _____ Zone ___ State _____

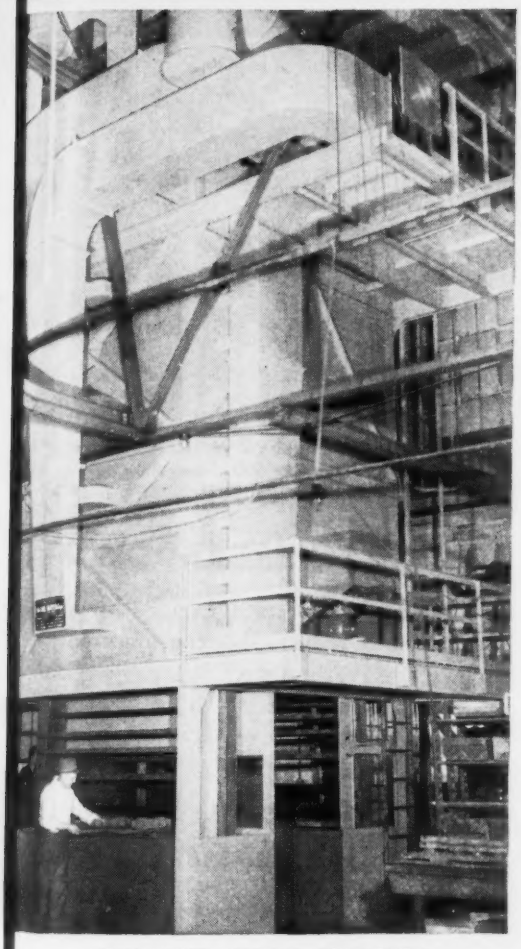
DOW CORNING DOW CORNING SILICONES **CORPORATION**
MIDLAND MICHIGAN

ATLANTA CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C. (Silver Spring, Md.)

In Canada: Fiberglas Canada Ltd., Toronto In Great Britain: Midland Silicones Ltd., London



CARL-MAYER HORIZONTAL MONORAIL CORE OVEN at Eclipse Aviation Co.
Patent No. 2355814

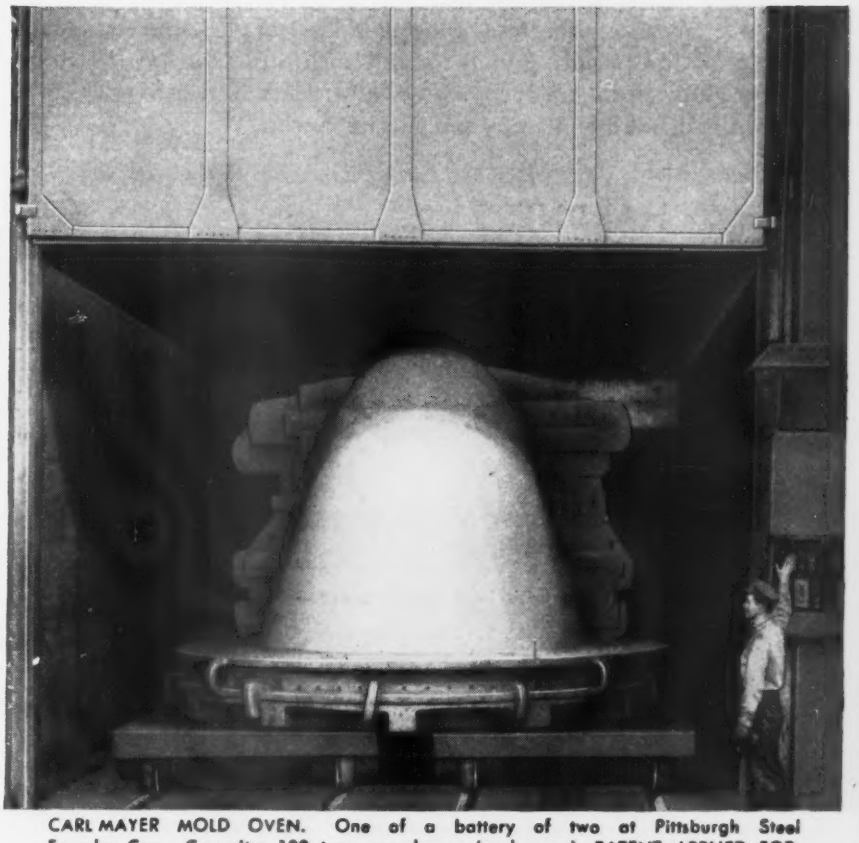


CARL-MAYER VERTICAL CORE OVEN
at G. & C. Foundry Company
Patent No. 2257180.

"BIG" Engineering brings big foundry oven jobs to CARL-MAYER

Carl-Mayer designs embody patented features which contribute to highest efficiency and economy in operation. It will pay you to consult us on your next core baking and mold drying problem. We build ovens of all types and sizes, also other types of industrial ovens and furnaces.

Write For Bulletin No. 53-CM.



CARL MAYER MOLD OVEN. One of a battery of two at Pittsburgh Steel Foundry Corp. Capacity: 100 tons per charge (each oven). PATENT APPLIED FOR.

CARL-MAYER CORE AND MOLD OVENS ARE SERVING CONCERNS LIKE THESE:

- minum Co. of America
- erican Brake Shoe Co.
- erican Radiator Co.
- w-Knox Co.
- wn Industries
- k Motor Div. of General Motors Corp.
- yrus-Erie Co.
- illac Motor Div. of General Motors Corp.
- umbia Steel Corp. (U. S. Steel Corp.)
- cible Steel Castings Co.
- kirk Radiator Co.
- pse Aviation Division of endix Aviation Corp
- tric Autolite Co.
- l Motor Co.
- mont Foundry Co.
- C. Foundry Co.
- eral Electric Co.
- eral Motors Corp. and ubsidiaries
- Gilbert & Barker Co.
- General Steel Castings Co.
- Golden Foundry Co., Inc.
- Henry Kaiser Corp.
- W. O. Larson Foundry Co.
- Mesta Machine Co.
- F. E. Meyers & Bro. Co.
- Oil Well Supply Co. (U. S. Steel Corp.)
- Packard Motor Car Co.
- Pittsburgh Steel Foundry Corp.
- H. B. Salter Co.
- Shenango Penn Mold Co.
- Standard Foundry Co.
- Union Brass & Metal Mfg. Co.
- Union Steel Castings Co.
- West Michigan Steel Castings Co.
- A. C. Williams Co.
- Whiten Machine Works
- Whiting Corp.

THE CARL-MAYER CORP.

3030 Euclid Ave., Cleveland, Ohio

Backed by reputation and over 30 years' experience

WHEELABRATOR® STEEL SHOT

19 Con

Assur

Here's The QUALITY You Have Needed . . . And Can Now Depend Upon When You Use "Wheelabrator" Steel Shot

Photo micrograph of Wheelabrator Steel Shot magnified 500 times, showing its homogeneous structure.

1 STRUCTURE

The microstructure of shot is of primary importance to cleaning speed and shot life as well as machine maintenance life. In producing Wheelabrator Steel Shot, the chemical analysis and microstructure are rigidly maintained to assure a product which is round, solid and free from surface cracks.

2 HARDNESS

The hardness of Wheelabrator Steel Shot was determined by our experience in installing and servicing more than 6000 Wheelabrator blast machines. This hardness is uniform and is achieved by exacting control of the analysis and by double heat treatment at automatically controlled temperatures.

3 RESISTANCE TO BREAKDOWN

The toughness and native impact strength of Wheelabrator Steel Shot drastically reduces shot consumption. Made of the toughest high carbon steel, it is subjected to daily tests to determine its resistance to breakdown under impact.

4 CONSTANT UNIFORMITY

19 elaborate control checks, listed below, combined with our modern automatic equipment, assure the constant high quality of Wheelabrator Steel Shot. As a result, you are sure of receiving the same highly efficient performance of the "test run" from every shipment.

19 Control Checks for *QUALITY*

MELTING	POURING	FIRST SCREENING	DRYING AND CONDITIONI
1. Rigid scrap selection. 2. Preliminary carbon and manganese analysis. 3. Complete chemical analysis.	4. Accurate and continuous control of pouring temperature. 5. Accurate and continuous control of quench temperature.	6. Visual and metallographic inspection in as-cast condition. 7. Hardness check in as-cast condition. 8. Continuous inspection of screening operation.	9. Recording tempe control. 10. Removal of obj able material.
SECOND SCREENING	**FIRST HEAT TREATING**	**SECOND HEAT TREATING**	**FINAL SCREENING**	**BAGGING**
11. Continuous inspection of screens.	12. Automatic control and permanent record by recording instrument of heat treat time and temperature.	13. Automatic control and permanent record by recording instrument of heat treat time and temperature. 14. Continuous tests for hardness and carbon content. 15. Continuous microscopic inspection.	16. Continuous inspection of screens and shot. 17. Daily laboratory checks of screening accuracy.	18. Continuous insp of shot. 19. Daily shot bre tests.

Checks for QUALITY

Peak Performance*

* HERE IS WHAT THIS NEW SHOT WILL DO FOR YOU

$ SLASHES ABRASIVE CONSUMPTION

A prominent Pennsylvania Malleable Foundry had an abrasive consumption of 36.458 lbs. per hour when using chilled iron as compared to only 3.234 lbs. per hour with Wheelabrator Steel Shot.

$ LOWERS CLEANING COSTS

A New York gray iron foundry reduced abrasive costs from $2.49 per hour to $1.54 per hour when they switched from chilled iron grit to Wheelabrator Steel Shot.

$ LENGTHENS PARTS LIFE

At a large Eastern steel foundry, the use of Wheelabrator Steel Shot resulted in a 150% increase in blade life with a corresponding increase in the usable life of other machine parts.

$ REDUCES MAINTENANCE LABOR

Due to the 300% increase in machine parts life resulting from the use of Wheelabrator Steel Shot, maintenance labor costs were drastically slashed at a prominent Eastern foundry. With fewer parts to replace, less time is required to keep machine in top working order.

$ REDUCES SHIPPING, HANDLING and STORAGE COSTS

It took a NEW PLANT and NEW PRODUCTION METHODS to Produce this New METALLURGICALLY - SUPERIOR STEEL SHOT

American

HEELABRATOR & EQUIPMENT CORP.

)5 S. Byrkit St., Mishawaka Ind.

The ONLY Blast Equipment Manufacturer Producing Steel Shot

BROWN FINTUBE *Sectional* EXCHANGERS

inexpensive three unit installation

COOLS TRANSFORMER OIL

eliminates downtime for electric furnace permitting continuous, safe operation

user says . . .

"We use a ——— furnace with a 2500 KVA transformer. Melting about 4½ tons every hour and five minutes, our transformer oil heated to 68° C. in about three hours. We then had to shut down the furnace and wait for the oil to cool to 65° C. which is considered safe temperature.

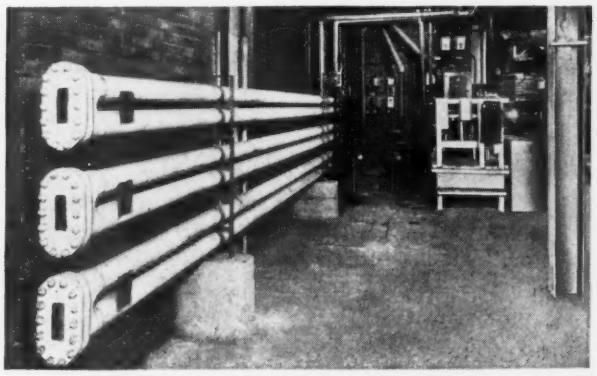
"These shutdowns for cooling totaled 2 to 3 hours of furnace time each day, and we were always operating with the transformer oil very close to the danger point.

"The transformer manufacturer recommended that we buy a new transformer, for $28,000.

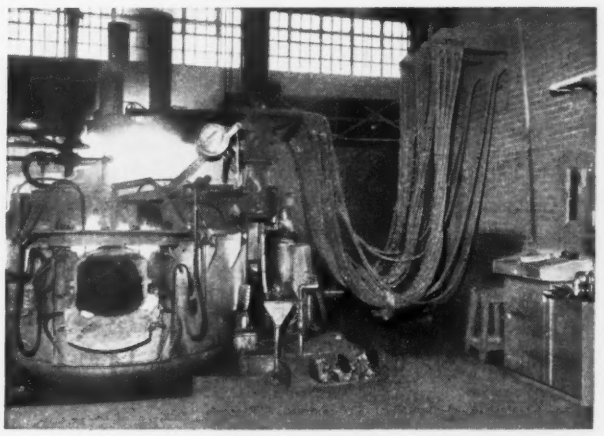
"Since installing your three section oil cooler however, we now operate the furnace continuously—**without any downtime for cooling**—and the temperature of the transformer oil has never exceeded 53° C. which is well below critical.

"Needless to say, we are **highly satisfied**"

If you heat—or cool—liquids or gases in your plant, it will pay you to investigate the many advantages of Brown Fintube's Sectional Heaters and Coolers. Send for Bulletin Numbers 511 & 512. They will give you ideas.

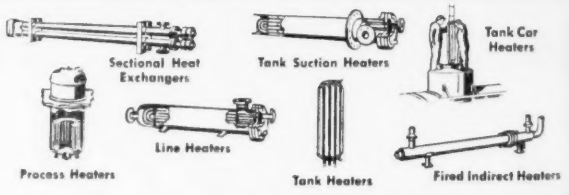


Above: View of 3 Brown Fintube Sectional Exchangers Cooling Transformer Oil in Steel Foundry. *Below*: View of Electric Furnace and Cables from Transformer Room.



BROWN FINTUBE
HEAT TRANSFER PRODUCTS

BROWN FINTUBE CO.
Elyria, Ohio

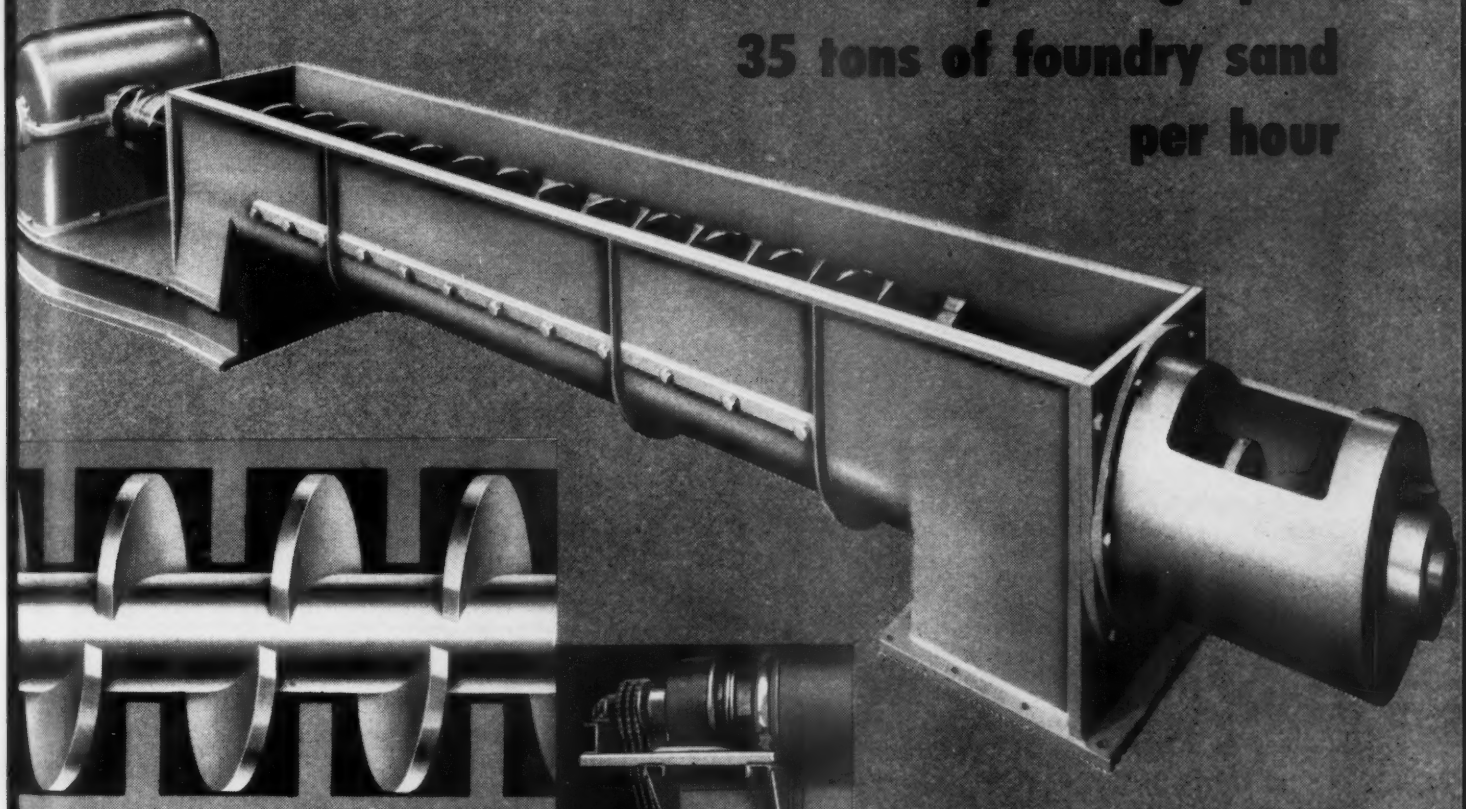


NEW YORK • BOSTON • PHILADELPHIA • PITTSBURGH • BUFFALO • CLEVELAND • CINCINNATI • DETROIT • CHICAGO • ST. PAUL • ST. LOUIS • KANSAS CITY
MEMPHIS • BIRMINGHAM • NEW ORLEANS • SHREVEPORT • TULSA • HOUSTON • DALLAS • DENVER • LOS ANGELES • SAN FRANCISCO • and ST. THOMAS, ONT.

Baker Perkins Ko-Kneader

(LIST SYSTEM)

an efficient new unit for continuously mixing up to 35 tons of foundry sand per hour



B-P Ko-Kneader in operation handling foundry sand

With revolutionary Baker Perkins Type M List System Ko-Kneaders, continuous mixing of foundry sand becomes a highly practical operation. Essentially, the Ko-Kneader is a mixing worm revolving as well as reciprocating in a trough provided with kneading teeth in such a way that the mixing worm works as a single mixing machine with each tooth. The repetition of this operation, as the sand moves along the trough, completes the mixing and mulling. Baker Perkins Ko-Kneaders save considerable mulling time and also help to improve casting quality because the intense mixing action blends the sand uniformly and thoroughly. Baker Perkins Ko-Kneaders are ruggedly built for long life and dependable service. When used with specially designed Baker Perkins Feeders, operation of the Ko-Kneader is almost entirely automatic, resulting in substantial savings in labor costs. Consult a Baker Perkins sales engineer or write today for complete information.

BAKER PERKINS INC. foundry equipment sales • saginaw, michigan

How Motor Patterns Co. speeds production...saves man hours with 3 BOKOE Patternmakers Millers

ALUMINUM AIRCRAFT DRAG WHEEL PATTERN. Milling a circular radius to ± .001". Note deep throat of machine and large worktable.

in the words of
FRANK J. OKLESSEN,
General Manager, The Motor Patterns Company, Cleveland

"With the variable speed changer, we don't have to stop the Bokoe mill in the middle of a cutting operation.

The length of table travel has been a salvation to us on many jobs which formerly required two set-ups. The power-driven turntable gives us lots more working height than the usual portable turntable on ordinary millers.

We also use it as a radial drill. By turning the swivel column 180°, we can bore holes in a large, heavy casting on a skid on the floor.

The 3 Bokoe mills in our plant have enabled us to do better work faster and more accurately on aluminum and cast iron work because the machine is so versatile.

Your service on parts and cutters has been wonderful."

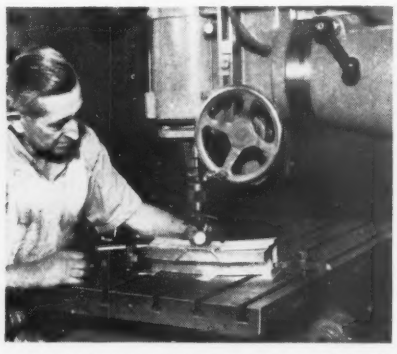
All good reasons why Motor Patterns Co. is adding another larger Bokoe Model F3 to its production line for milling steel. And its affiliate plant has also installed two Bokoe Milling Machines. Good reasons, too, why you can mill it better with a Bokoe. Write for complete details.

These leading plants use the Bokoe Miller, too

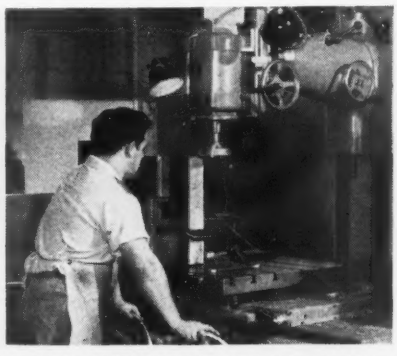
CONVAIR FORD ARROW ALUMINUM CASTINGS CO
AUTOMOTIVE PATTERN SUPERIOR PATTERN & MFG

Bokoe Universal High Speed Milling Machines are made in several models for accurate machining of patterns and models in wood, non-ferrous metals and steel.

DELIVERY FROM STOCK. ENGINEERED SERVICING AND STOCK PARTS FROM ORBAN SERVICE CENTERS IN NEWARK, DETROIT, CLEVELAND.



MACHINING CORE BOX – LOOSE PIECE. Circular radius in aluminum workpiece is milled to ± .001" with spiral cutter.



MAGNESIUM SIDE PLATE FOR CRANK CASE CORE BOX. Squaring off end of side plate to ± .001" with fly cutter at 850 RPM.

SPECIFICATIONS

Size of worktable 28" x 48"

Manual table movement—Transverse 28" longitudinal 48"

Automatic feed for transverse, longitudinal and rotary movement

Max. diameter of turntable work—8'6"

Depth of throat (between column slide and spindle center)—35"

Designed for standard U.S. voltages and frequencies; calibrations and lead screws in inches.

KO CO., INC. INDUSTRIAL IMPORTERS

KURT ORBAN COMPANY, INC.

205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 3 • 19450 James Couzens Highway, Detroit 35
1939 Santa Fe Ave., Los Angeles

Accept No Substitutes!

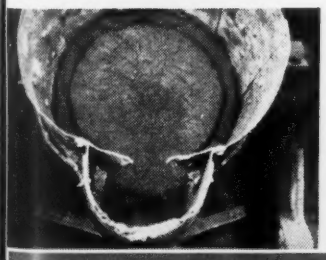
HELSPOT—for lining all types of ladles, cupola wells, spouts, runners, etc.—was introduced on the market during World War II. It was hailed as "a great contribution to our war effort!"

A lot of serious thought, careful testing in the field and scientific know-how (besides some top quality raw materials!) have gone into HELSPOT. We've been proud of the service records it has been making in plants where it is being used.

HELSPOT has been given a thorough baptism of fire, on the job, by Foundrymen the country over. Many have suggested new and practical uses for HELSPOT in the metallurgical industry.

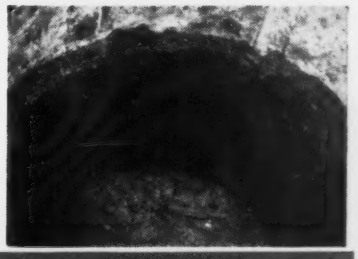
If you are not now using HELSPOT we invite you to test it in your own plant. And . . . why not ask your Foundry friends about their success with HELSPOT?

- ☐ HELSPOT is packed in 100-lb. water-proof cartons, already sliced for ease of handling.
- ☐ HELSPOT DRY is available for those who prefer a dry material, to be mixed on the job. Shipped in 100-lb. bags.



1. Tamp in bottom, leaving a trench around outside edge.

2. Place slices solidly in trench to provide sealed joint.



3. Seal joints where slices butt together, forming valley.

4. Tamp narrow strips into valleys to seal joints tightly against metal construction.

5. Taper top edge, tamp it flat between sidewall and bottom to form a tight seal.

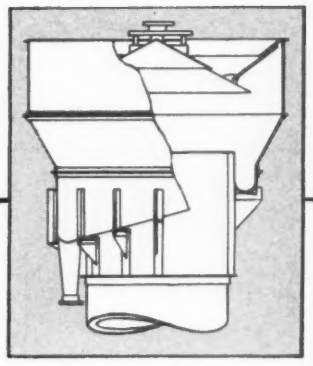
6. Form pouring spout. Smooth to form skimmer. Roughen entire lining surface.

MEX-R-CO

Mexico Refractories Company

Mexico, Missouri

Affiliate: National Refractories Co., Lewis Tower Bldg., Philadelphia, Pa.



SCHNEIBLE

CUPOLA COLLECTORS

WASH OUT FOUNDRY FLY-ASH AND FUMES TO CUT BUILDING MAINTENANCE COSTS

Here's a modern automotive foundry with 8 Schneible Cupola Collectors on guard against corrosion and deterioration. Fly-ash and fumes cannot play havoc with roofs, gutters, stacks or machinery. Building maintenance is kept at a minimum.

These Schneible Collectors effectively wash out the elements that cause nuisance and sluice them away to dewatering and recirculating tanks for easy removal.

Economy of operation and efficiency are outstanding features of these Cupola Collectors. Water conservation is assured because the dewatering tanks are designed to purge and recirculate the same water continuously. There are no moving parts that require maintenance and the water distribution head cannot clog.

Your local Schneible representative has further information or write direct for bulletin No. 449.

CLAUDE B. SCHNEIBLE COMPANY

P. O. Box 81, North End Station
Detroit 2, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES—CONSULT YOUR LOCAL TELEPHONE DIRECTORY.

Late Foundry News

MAY 27, 1953

WHAT'S AHEAD?: Despite occasional soft spots in the business picture, optimism still dominates forecasts on future industrial activity. Typical is the opinion of the Business Survey Committee of the National Association of Purchasing Agents. With very little hedging as to peace, war and defense cutbacks, 53 per cent of this group look for good business through third quarter and another 31 per cent hold that view to the end of the year. Only 16 per cent expect a gradual business decline in the second half.

On the question of price trends, the committee divides up this way: 57 per cent for no major changes, 35 per cent see a gradual decline and 8 per cent an upturn.

Shipments of gray iron castings in March were the largest for any month since October, 1951, the Bureau of the Census reports. Malleable shipments were the best since May, 1951, and steel casting shipments topped any month since January, 1952.

FOUNDRY EXPANSION: Among certificates of necessity issued recently by the Office of Defense Mobilization are 22 involving about $1,630,000 for new or expanded foundry facilities. Companies and amounts involved include:

Lebanon Steel Foundry, Lebanon, Pa., $71,220; St. Marys Foundry Co., St. Marys, O., $47,732; L. Schreiber & Sons Co., Norwood, O., $94,500; Boston Electro Steel Castings Inc., Boston, $11,616; Warren Foundry & Pipe Corp., Phillipsburg, N. J., $104,835; Riverside Foundry Co., Wrightsville, Pa., $10,543; Lynchburg Foundry Co., Radford, Va., $100,068; Electroloy Casting Corp., Birmingham, $479,002; Paul M. Wiener Foundry Co., Muskegon, Mich., $11,666.

Also Consolidated Iron-Steel Mfg. Co., Euclid, O., $9974 (two certificates); Lakey Foundry Corp., Muskegon, $76,500; Oberhelman-Ritter Foundry Co., Cincinnati $115,000; East Akron Casting Co., Akron, O., $41,960; Grede Foundries Inc., Milwaukee, $163,004 (four certificates); Lakeside Malleable Castings Co., Milwaukee, $102,920; Zenith Foundry Co., West Allis, Wis., $56,856; D. J. Murray Mfg. Co., Wausau, Wis., $93,000; Washington Iron Works, Seattle, $40,000.

SCRAP EXPORTS: Iron and steel scrap consumers, as represented by their NPA advisory committee, are unanimously opposed to exports of scrap from continental United States. At a recent Washington meeting they suggested that needs of friendly nations might be obtained from the Aleutian Islands, Guam or Hawaii.

On the other hand, some scrap industry members say there are tonnages of scrap in California, and probably in Florida and Texas, which dealers or brokers are unable to move. They feel this scrap should be permitted to go to friendly countries. A firm government policy on licensing exports of scrap is in the making.

MORE CAPACITY: Several industrial expansion goals have been raised by ODM. By-product coke oven capacity has been increased 1,800,000 tons to reach 85,800,000 tons annually by Jan. 1, 1955.

A new expansion goal for copper foundry facilities has been established at $5,500,000 of capital investment, to be completed by Jan. 1, 1954. This is $3,500,000 over the goal announced last Nov. 7.

MANAGEMENT CHANGE: Howard Foundry Co., Chicago, ferrous and nonferrous castings producer, has taken over the management of Alumicast Corp., Chicago permanent mold aluminum foundry. Operations of Alumicast, a subsidiary of Christiansen Corp., Chicago, are being transferred to Howard's plant at 1700 North Kostner Ave.

The name Alumicast Corp. will be retained and its capacity will be expanded to about 135,000 lb daily, a four-fold increase. The move restores permanent mold facilities to Howard, which closed its permanent mold division to make room for magnesium sand casting production several months after start of the Korean war.

NICKEL ALLOCATION: Distribution of nickel will be on a monthly basis instead of quarterly, starting in July. NPA says the new plan will simplify spreading available supply equitably as changes occur in defense needs.

Nickel supply still is tight, and some 40 more items have been added to the list of civilian articles for which nickel use is banned in their manufacture.

MAGNESIUM CUTBACK: Five of the government's six magnesium plants are being taken out of production. These plants, with a combined rated capacity of about 116 million pounds annually, were built during the last war and reacti-

vated in 1951. They are located at Painesville, O., Canaan, Conn., Wingdale, N. Y., Manteca, Calif., and Spokane. The Velasco, Tex., plant will stay in production; its 80-million-pound capacity will augment private capacity of about 56 million pounds.

AWARD: Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, has been nominated to receive a 1953 Award of Merit of the American Society for Testing Materials. The award, recognizing his distinguished service to the society, will be presented June 30 at the ASTM annual meeting and luncheon in Atlantic City.

PERSONALS: Robert E. Berry, assistant to the treasurer, Allegheny Corp., Cleveland, is joining the Gray Iron Founders' Society, Cleveland, as assistant to the executive vice president.

Carlyle J. Mills, Chicago attorney, has been appointed regional counsel and assistant to Charles T. Sheehan, executive secretary of the National Foundry Association, Chicago.

George Johnstone Sr., who retired in 1951 from Johnstone Foundries Inc., Grove City, Pa., after spending 59 years in the foundry industry, died May 2.

MISCELLANY: Woodward Iron Co., Birmingham, has appointed Hickman, Williams & Co. as sales representative for its pig iron in a number of market areas, effective June 1.

Industrial Minerals Division of International Minerals & Chemical Corp., Chicago, has started construction of a new refractory specialties plant at Janesville, Wis. Its annual capacity will be 75,000 tons. Chief product will be granular refractory for air application in patching melting furnaces.

Loans granted recently by the Reconstruction Finance Corp., include $200,000 to the Fort Die Casting Corp., Marysville, Mich., and $70,000 to Barclay Foundry Inc., Milwaukee.

A new chromium alloy now in production at the huge plant being completed at Marietta, O., by the Electro Metallurgical Co. is expected to make possible the manufacture of better quality stainless steel at lower cost. An extremely low carbon ferrochrome, it resulted from ten years' research costing several million dollars.

PRICES OF FOUNDRY METALS AND COKE (As of May 27, 1953)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.50-17.00
New River	20.80
Wise County	15.95
OVEN	
Birmingham	$21.65
Chicago	24.50
Detroit	25.50
Erie, Pa.	25.00
Everett, Mass.	26.05
Indianapolis	24.25
Kearney, N. J.	24.00
Milwaukee	25.25
New Haven, Conn.	23.45
Painesville, O.	25.50
Philadelphia	23.95
Portsmouth, O.	24.00
St. Louis	26.00
St. Paul	23.75
Swedeland, Pa.	23.85
Terre Haute, Ind.	24.05

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$57.00	$57.50
Birmingham	51.38	....
Buffalo	55.00	55.50
Chicago	55.00	55.00
Cleveland	55.00	55.00
Everett, Mass.	59.50	60.00
Fontana, Calif.	61.00	....
Geneva, Utah	55.00	....
Granite City, Ill.	56.90	57.40
Lone Star, Tex.	51.00	51.00
Neville Island (Pittsburgh)	55.00	55.00
Steelton, Pa.	57.00	57.50
Swedeland, Pa.	59.00	59.50
Toledo, O.	55.00	55.00
Troy, N. Y.	57.00	57.50
Youngstown, O.	55.00	55.00

NONFERROUS INGOT

BRASS AND BRONZE: 85-5-5-5—26.00c; 88-10-2—34.75c; 80-10-10 — 30.00c; No. 1 yellow — 21.25c.

ALUMINUM: 99 per cent plus, primary ingots 20.50c. Secondary No. 12 alloy 22.00-22.50c. Deoxidizing grades: No. 1 23.00-23.25c; No. 4 20.50-21.00c.

MAGNESIUM: 99.8 per cent standard ingots 27.00c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 29.75-30.00c, Connecticut valley.

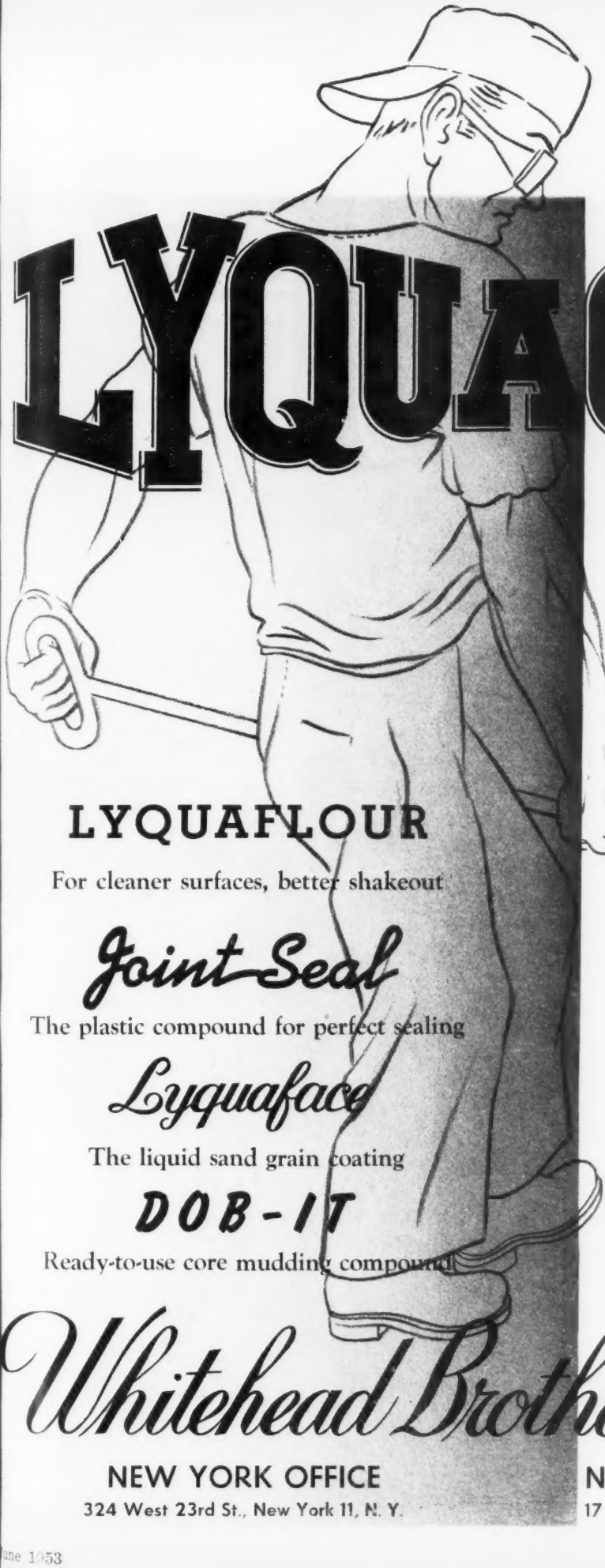
ZINC: High grade 12.35c, delivered. Die casting alloy 15.50c, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$29.50-30.50	**$38.00-39.00	**$30.00-31.00	.....	.....	.....	$45.00-46.00
Boston*	**30.00-31.00	**34.00-35.00	.....	.....	**43.00-44.00	.....	.....
Buffalo	41.50-42.00	40.50-41.50	.....	.....	44.50-45.00	.....	52.00-53.00
Chicago	35.00-37.00	39.00-40.00	.....	40.00-42.00	42.00-43.00	39.00-41.00	50.00-52.00
Cincinnati	41.00	43.00	**37.00	38.00	48.00	45.00	53.00
Cleveland	39.00	43.50-44.00	37.00-38.00	45.00-46.00	43.00-45.00	49.00-50.00	53.00-55.00
Detroit	31.00-32.00	45.00	29.00-30.00	42.00-43.00	.....	.....	.....
Los Angeles	28.00	40.00-43.00	.....	.....	.....	.....	.....
New York	33.00-34.00	33.00-34.00	.....	.....	.....	.....	.....
Philadelphia	41.00-42.00	39.00	43.00	.....	47.00-48.00	.....	.....
Pittsburgh	39.00-40.00	39.00-40.00	37.00-38.00	.....	49.00-50.00	.....	50.00-52.00
St. Louis*	32.00	41.00-42.00	30.00-32.00	44.00	.....	36.00	53.00-54.00
San Francisco	29.00	40.00	45.00	52.00	52.00	55.00	42.00-45.00
Seattle	33.00	**40.00	**36.00-38.00	.....	.....	.....	.....

* Brokers' buying prices. ** F.o.b. shipping point.

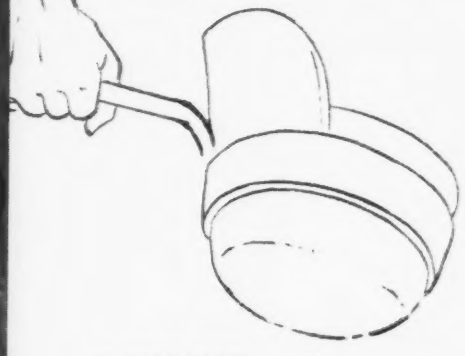


Established 1851

LYQUAGRIP

An odorless, non-fermenting, economical, easy to use, ready mixed core paste, uniform at all times

1. **LYQUAGRIP**, light in color, is an extra strong corepaste.
2. **LYQUAGRIP** is odorless and non-corrosive.
3. **LYQUAGRIP** is a rapid-drying core paste at room temperatures.
4. **LYQUAGRIP** is unaffected by normal storage.
5. **LYQUAGRIP** washes off tools and hands easily with warm water.
6. **LYQUAGRIP** has no appreciable gas generation.



7. **LYQUAGRIP** pasted cores can be reheated without damaging the pasted joint.
8. **LYQUAGRIP** is unaffected by mold humidity.
9. **LYQUAGRIP** will not harm steel, brass or bronze.
10. **LYQUAGRIP** pasted joints are stronger than the core.
11. **LYQUAGRIP** cannot be overbaked or overdried.
12. **LYQUAGRIP** is uniform at all times.

You Owe It To Yourself To Investigate Our Claims

LYQUAFLOUR

For cleaner surfaces, better shakeout

Joint-Seal

The plastic compound for perfect sealing

Lyquaface

The liquid sand grain coating

DOB-IT

Ready-to-use core mudding compound

Whitehead Brothers Company

NEW YORK OFFICE
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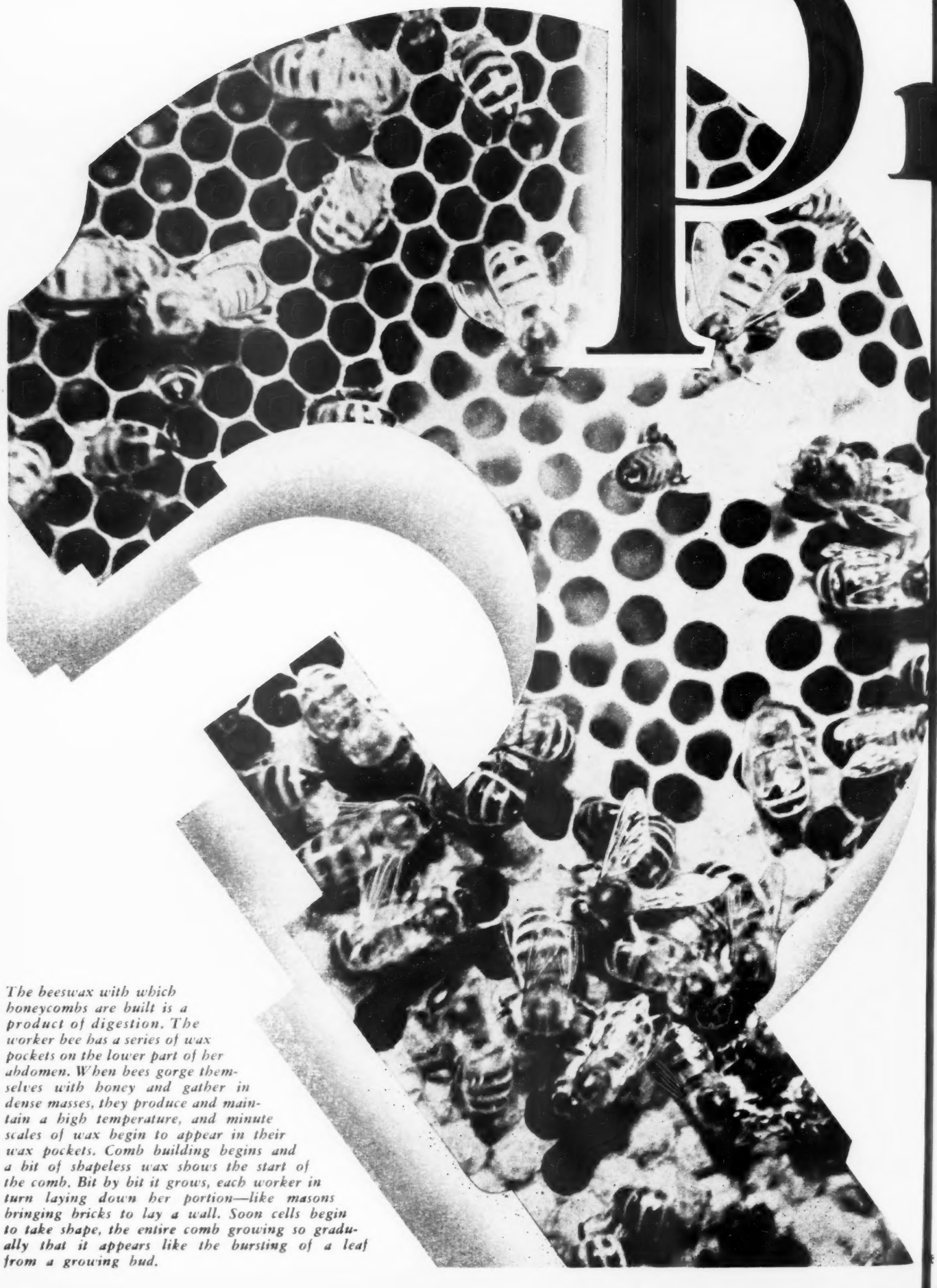

The beeswax with which honeycombs are built is a product of digestion. The worker bee has a series of wax pockets on the lower part of her abdomen. When bees gorge themselves with honey and gather in dense masses, they produce and maintain a high temperature, and minute scales of wax begin to appear in their wax pockets. Comb building begins and a bit of shapeless wax shows the start of the comb. Bit by bit it grows, each worker in turn laying down her portion—like masons bringing bricks to lay a wall. Soon cells begin to take shape, the entire comb growing so gradually that it appears like the bursting of a leaf from a growing bud.

ecision

It's amazing that the walls of a honeycomb, only .002″ to .003″ in thickness, will support such weight as combs must do when filled with honey. The answer is in the hexagonal design of the cells and the *precision* with which each cell is fitted to the other.

To meet the demands of modern foundry production, HINES FLASKS and JACKETS, too, are designed and built with the utmost precision. They're assembled around dies to insure absolute uniformity, so that when the flask is removed from a mold, the jacket fits it like a glove. Perfect teamwork . . . for trouble-free production.

HINES precision is well known to foundrymen. That's why you'll find more HINES FLASKS and JACKETS than any others in leading foundries. If you're not using them now, why *aren't* you?

HINES FLASKS AND JACKETS

Hines Flask Co., 3431 West 140th Street, Cleveland 11, Ohio • Telephone: ORchard 1-2806

Planned

These Folders Are Fre

This literature is availabl anyone interested in bett grinding operations. Com Sterling specifications are g able for quick reference. W today and we will gladly s you these important data fol for your file . . . no obliga naturally!

THE STERLING ABRASIVE

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BRANCHES . . BOSTON — CHICAGO — CLEVELAND — DETROIT

meet the specific demands of your snagging or illet grinding job . . . and do it faster at much wer cost.

Sterling Grinding Wheels stand up under the rough, slam-bang use encountered in casting-cleaning and billet operations. Sterling's "Wheels of Industry" readily accept the unusual demands of your grinding situation because they are specifically designed to provide better-than-usual service.

Cool-running, easier-handling, longer-lasting Sterling Grinding Wheels give greater savings per pound of metal removed. Their special bonds retain the abrasive grains until <u>all</u> their sharpness has been used. That's why these superior wheels cost so much less to operate and why they outlast ordinary abrasive units.

<u>On your jobs</u>, where Sterling Grinding Wheels can <u>prove</u> their performance—that's where they demonstrate their value against other units. Sterling engineers, skilled in every phase of billet grinding and casting-cleaning operations, can readily select the proper wheels for your particular use. There need be no guesswork . . . a conference will quickly result in your obtaining tested "Wheels of Industry" built to snap up your job speed and profits. Ask for this free service.

THE WHEELS OF INDUSTRY
STERLING ABRASIVES
Plus VALUE
ABRASIVE PRODUCTS FOR
• BETTER GRINDING
• FASTER GRINDING
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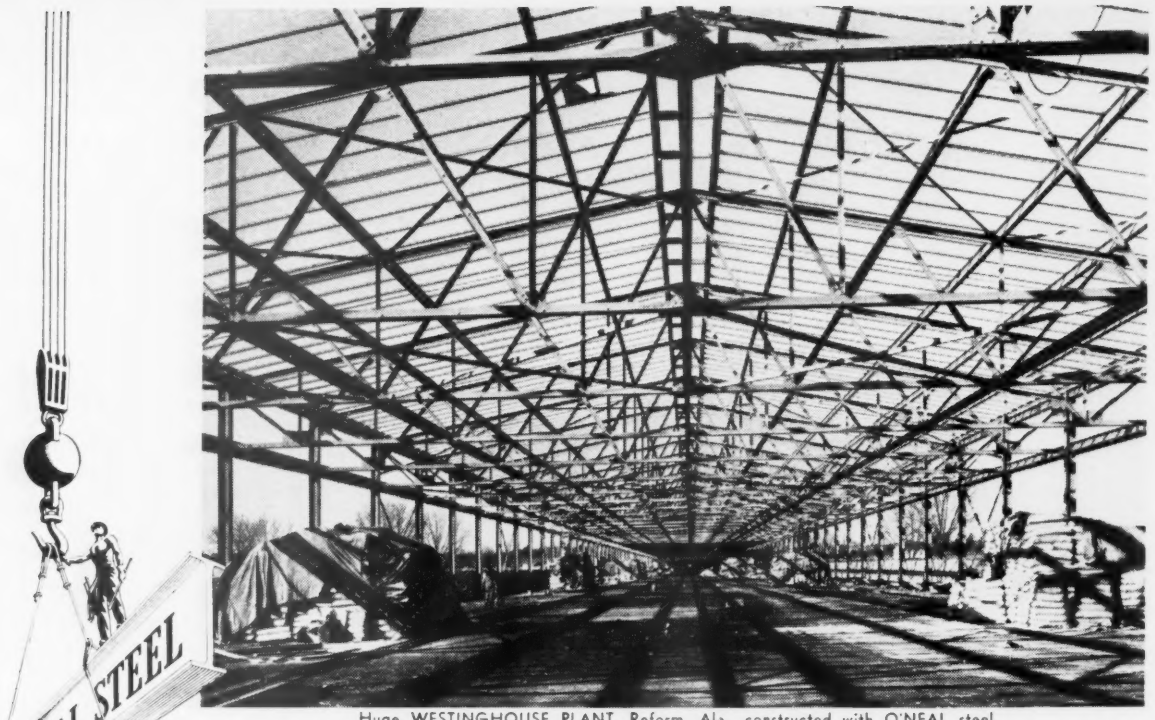


Huge WESTINGHOUSE PLANT, Reform, Ala., constructed with O'NEAL steel.
RUST ENGINEERING COMPANY, Birmingham, Ala., Engineers.

$4,000 Borrowed Capital *Started* BIRMINGHAM'S *Growing* O'NEAL STEEL WORKS

Back in 1922, Kirkman O'Neal, young son of a distinguished Alabama Governor, decided that the Nation's best location for a steel fabricating firm was Birmingham. With $4,000 borrowed capital he started his own Company in a small shed with only five employees.

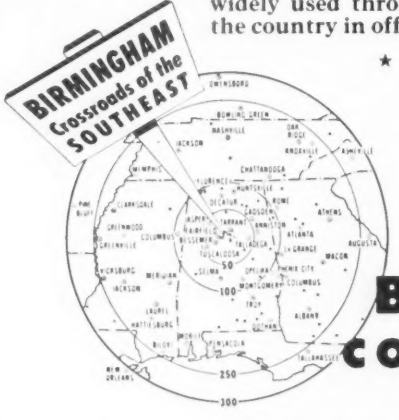
Today the O'Neal Steel Works is one of the Nation's largest fabricators and distributors of structural steel products. This front rank position has been attained without addition of any outside capital. The Company's efficient, modern plant covers 20 acres. It also maintains in Birmingham the largest steel warehouse in the Southeast and its own fleet of specially built trucks.

O'Neal's biggest market is the rapidly developing Southeast, though O'Neal steel is widely used throughout the country in office and commercial buildings, industries and warehouses.

President O'Neal gives Birmingham and his loyal employees major credit for his Company's great growth.

"We simply grew up with the Birmingham district," he says. "Nowhere else could we have found the unique and complete combination of favorable growth factors . . . a doorstep supply of steel and the friendly cooperation of producing mills . . . a basing point for steel that enables us to save on freight rates anywhere we ship . . . a central location in the Southeast that helps us serve this important market economically and speedily . . . low-cost fuel and power . . . and loyal and efficient workers with whom we have always enjoyed a very fine relationship."

★ ★ ★ ★ ★ ★ ★



Doors of opportunity are open wide today in the Birmingham district for many enterprises—large and small—with growth potentialities. The Birmingham Committee of 100 invites you to investigate the advantages of the Birmingham district as a manufacturing and distribution point. For specific information, write this Committee or any of the undersigned.

BIRMINGHAM COMMITTEE OF 100

1914 Sixth Ave., N., Birmingham, Ala.

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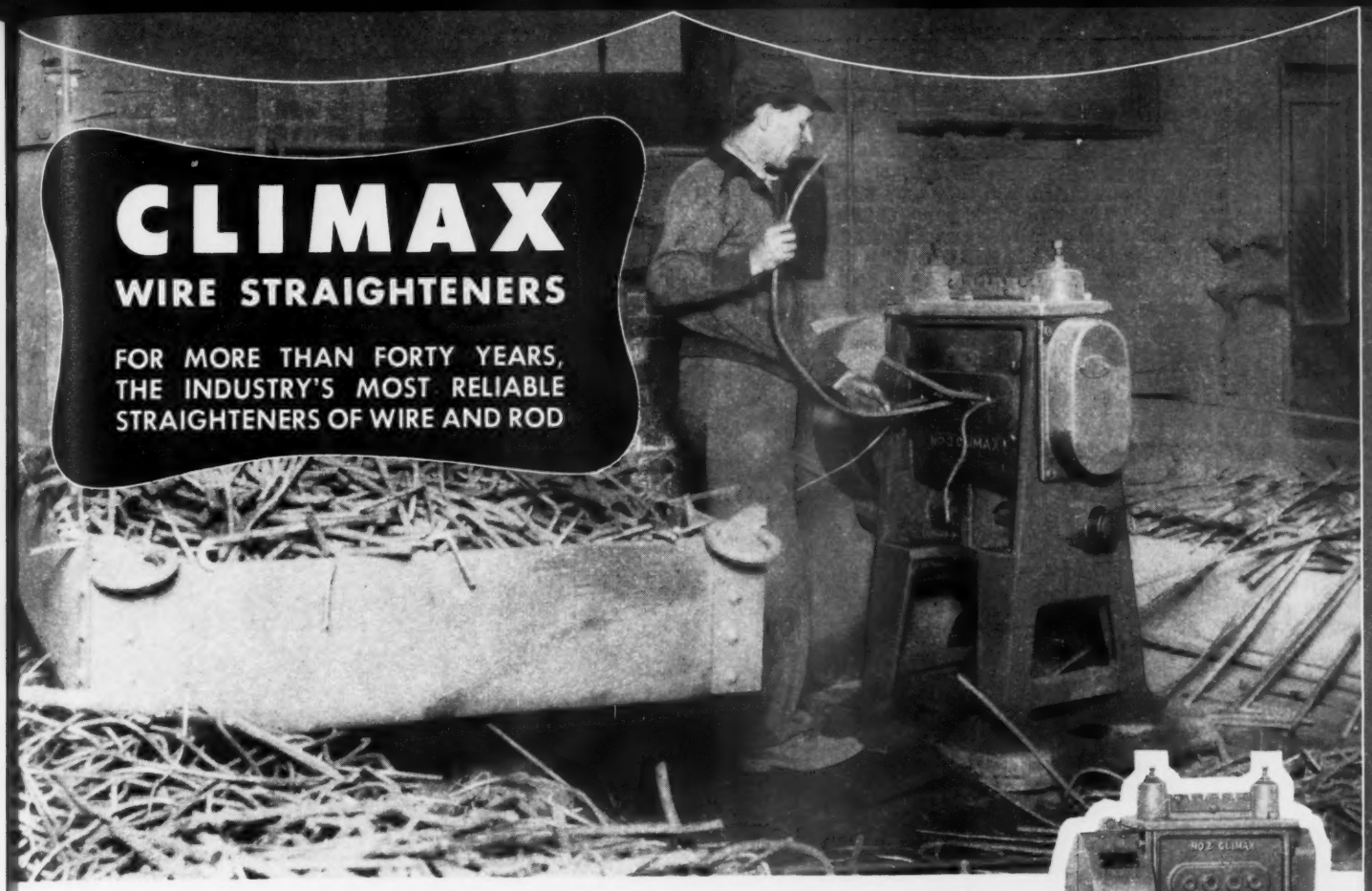
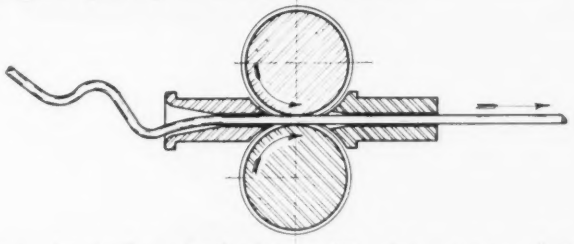


CLIMAX
WIRE STRAIGHTENERS

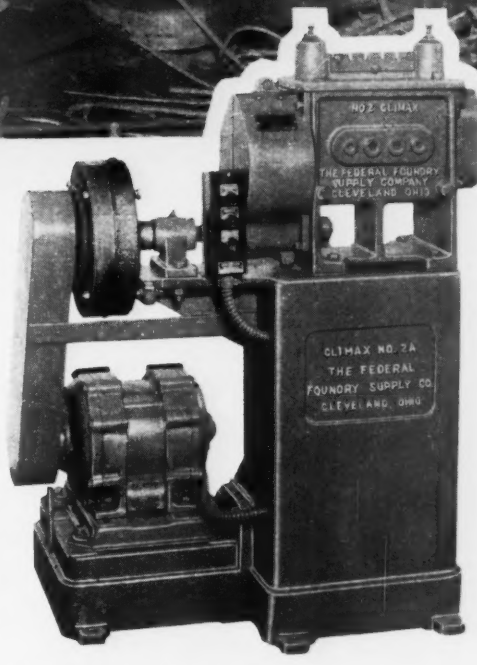
FOR MORE THAN FORTY YEARS, THE INDUSTRY'S MOST RELIABLE STRAIGHTENERS OF WIRE AND ROD

Reclaim your used core rods and wires and save money—with the CLIMAX. Operated safely and efficiently by unskilled labor. Straightens random lengths quickly and economically.



Bent wire is first checked in guide slots at top of the machine to determine proper feed hole, then inserted in feed hole, straightened between two heavy, alloy steel rolls under spring tension and ejected at back with a slight, natural bend, just right for core rod use.

Safety for the operator, as well as long life for the machine, is insured by enclosing gears and other moving parts. On motorized units, V-belts are enclosed and electrical wiring protected. Conveniently mounted controls and a reversible magnetic switch provide full protection for operator and straightening rolls, by enabling operator to stop or reverse machine instantly.



MODEL 2A
motorized

Handles 4 wire sizes, 1/16" to 1/4". A complete unit, ready for operation when connected to current supply.

MODELS AVAILABLE

The CLIMAX is offered in three sizes: to handle 4 wire sizes from 1/16" to 1/4"—4 sizes from 3/16" to 1/2"—and 5 sizes from 1/4" to 3/4". Each size may be furnished in three styles, as follows:

(1) Completely motorized—ready to operate.
(2) With gear reduction unit for your motor.
(3) With extended shaft for your own drive.

Write for additional information and prices, specifying wire sizes and model style.

FEDERAL

The **FEDERAL FOUNDRY SUPPLY** *Company*

4600 EAST 71st STREET, CLEVELAND 5, OHIO

CROWN HILL, W. VA. · CHICAGO · CHATTANOOGA · DETROIT · MILWAUKEE · NEW YORK · RICHMOND · LOS ANGELES · UPTON, WYO.

For cleaner castings, improved sand recovery get a LINK-BELT foundry shakeout

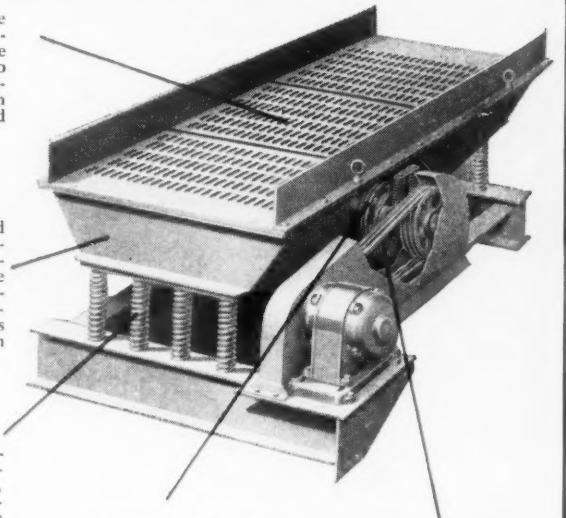
Dust control is facilitated when you centralize operations on an efficient Link-Belt foundry shakeout.

Increased output, improved working conditions also result when you eliminate manual shakeout

EFFICIENT design of Link-Belt foundry shakeouts permits continuous, straight-line operation for greater output. With operating parts recessed, there is ready access from all four sides.

High-speed, economical separation of castings from flasks and molds is achieved, together with faster reduction of sand lumps and temperatures. What's more, costly flask damage is eliminated . . . reclaiming of rods, gaggers and sprues simplified.

Both medium (shown at right) and heavy duty types have rugged construction plus full protection of all moving parts for minimum maintenance. Oversize, cartridge-mounted roller bearings assure accurate alignment. For complete information, ask your Link-Belt sales office for new Book 2438.



Removable steel perforated plates are fabricated to suit a particular job, with or without skid bars.

Built-in sand hopper requires minimum pit space to feed conveyor or under shakeout, protects springs from sand.

Square-end helical springs carry all impact, transfer vibration to live deck, end overloading of all parts.

Enclosed, full-floating vibrator has automatic, centrifugally operated weights that limit motion during starting and stopping, reduce starting torque.

Vibration amplitude controlled by varying segmental weights in automatic unbalanced weight assembly.

LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

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LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities.

13,251

USCO

For 49 years, pioneers in aluminum development.

35000 LBS. TENSILE STRENGTH ...WITHOUT HEAT TREATMENT!

USCO T is the high-tensile aluminum alloy that gives you physical properties usually obtainable only by heat treating —without this delay and costly extra step.

USCO T can be cast in both sand and permanent mold. Typical properties in sand after two weeks natural aging are 35000 T. S., 25000 Y. S., 5% elongation and 74 Brinell. The elimination of heat treating minimizes warpage problems.

USCO T is available now for prompt shipment. For further information on this exceptional time and money saving aluminum alloy contact your USCO representative now or write us direct.

FREE —Send for your USCO Aluminum Alloy Selector. A handy guide to analysis, specifications and many other foundry problems.

USCO **U. S. REDUCTION CO.**
East Chicago, Indiana

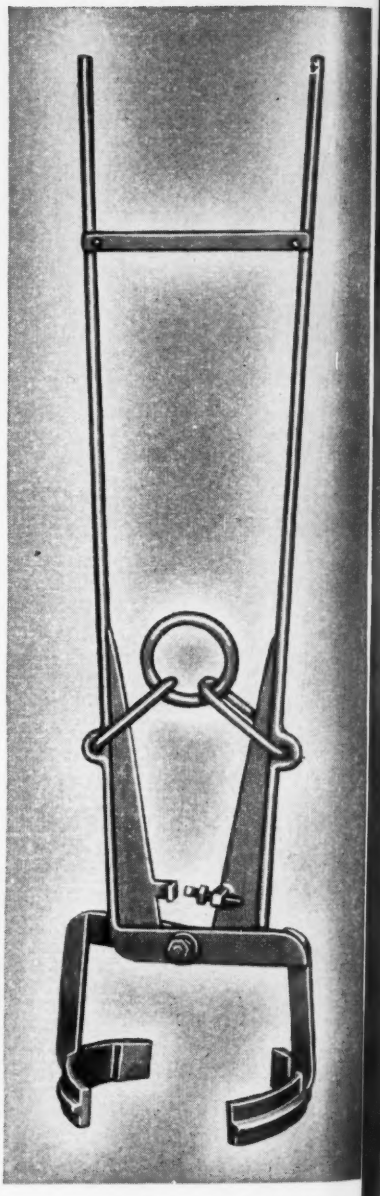
PLANTS: EAST CHICAGO, INDIANA • TOLEDO, OHIO

NO. 1 SOURCE FOR

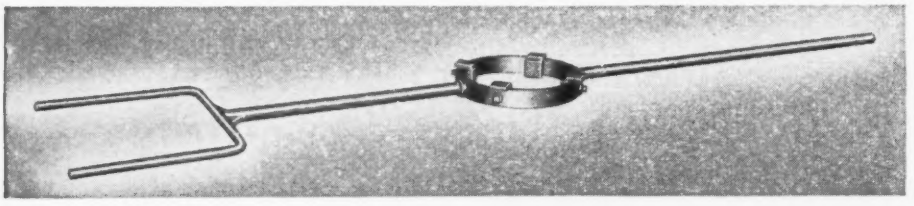
Bowls · Shanks · Tongs

Industrial Equipment round bottom pressed steel ladle bowl, 50 lb. capacity, type 7 flat side.

Industrial Equipment round bottom pressed steel ladle bowl, 60 lb. capacity, type 14 circular.

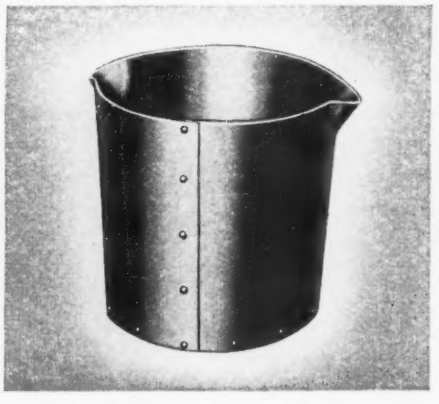


Type 72C crucible tongs. Adjustable. Four-point suspension. Claw types also available.



Industrial Equipment type 30CA single and adjustable ladle and crucible shank. Four-point suspension . . . easily adjustable . . . no springs . . . air cooled band. Fixed band types also available.

Industrial Equipment type 514 flat bottom welded steel ladle bowl. Available in almost any size or thickness.



Industrial Equipment 537 flat bottom riveted steel ladle bowl.

The above Industrial Equipment products, along with dozens of other types of bowls, shanks, tongs and ladles, are included in our latest catalog. *Write for your copy.*

LADLES

SHANKS

BOWLS

TONGS

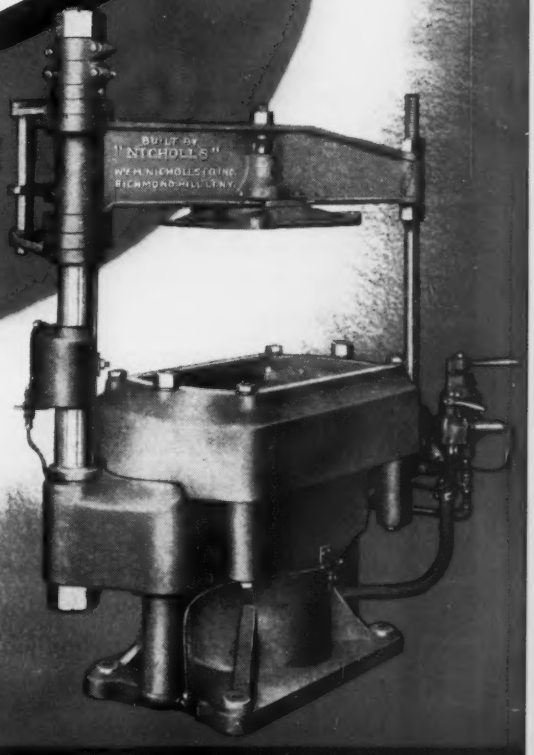
Industrial
EQUIPMENT COMPANY

115 NORTH OHIO ST., MINSTER, OHIO

Progressive Leadership

In The Foundry Industry 43 Years

Heavy Duty Molding Machines by NICHOLLS



W IN THEIR 43rd YEAR OF SERVICE TO THE FOUNDRY INDUSTRY

enter our 43rd year of continuous service to the Foundry Industry, proud to be singled out as leaders in our field through war time ency and peace time competitive advancement. Your past support s us to strengthen our efforts to maintain the leadership you have us achieve. NICHOLLS MOLDING MACHINES will continue to keep t of industrial changes and necessities in the future, as in the past.

WM. H. NICHOLLS CO., Inc.

RICHMOND HILL (18), LONG ISLAND, NEW YORK

Protective Clothing

Asbestos Aprons?

Chrome Leather?

Flame-Resistant Duck?

WE MAKE 'EM ALL—

AND WE MAKE 'EM TO WEAR!

AO aprons protect the body against sparks, splashes, cuts and abrasions in many operations such as grinding, tending blast furnaces, bench and drill press work.

We make aprons in asbestos, chrome leather, flame-resisting duck, and Neoprene. Some have plain reinforcing patches; others are completely steel-stapled for greater protection. On Neoprene aprons, stomach patches are available for more resistance where wear may come. *All* are quality garments. Your AO Safety Products Representative will be glad to suggest the type of apron that will do the *best* protection job for your workers for the *longest* periods on *each specific job*. Just tell him what your hazards are.

Quick Facts

- Sizes 12 x 24, 24 x 30, 24 x 36, 24 x 42, 24 x 48 in asbestos and chrome leather
- Asbestos and chrome leather aprons available regular or split leg in all sizes except 12 x 24 which is regular only
- Sizes 12 x 24, 29 x 30, 29 x 36, 29 x 42 and 29 x 48 in flame-resisting duck

American Optical

SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

telling the story of 'dag' dispersions

Here is a Better Parting Compound ...No Smoke at Any Temperature

It's a 'dag' dispersion . . . a material that's first of all a friction-fighting, heat-beating mold wash. Spray it on, paint it on, apply it by dipping. Molds, patterns, chills, cores . . . even push pins, shoulder screws, flask pins, and ladle interiors . . . they'll all take on a microscopically thin, slippery, *dry film,* that will banish sticking for good.

Try 'dag' dispersions. Parting will be quicker, castings will be smoother, than with any other parting agent. Binding and stripping will be eliminated. Chills will tap off easily without damage to casting surfaces.

As an added benefit, water dispersions of 'dag' colloidal graphite get rid of the irritating smoke caused by most parting compounds.

You can learn more about **'dag'** parting compounds by asking for Bulletin No. **425-14F.**

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

dag DISPERSIONS

Acheson Colloids Company, Port Huron, Mich.
... also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND
Units of Acheson Industries, Inc.

try resin-bonded dry graphite films for permanent lubrication

DELTA
FAST-DRI
CORE OILS ...AND BINDERS

FOR
FASTER PRODUCTION
OF
BETTER CORES
at low cost!

Cores made with DELTA 155-X and 168-X FAST-DRI Core Oils have 1) — an unusually high tensile strength (20% greater than raw linseed oil), 2) — a lower gas ratio, 3) — a higher degree of elasticity and 4) — less core embrittlement.

Core sands made with DELTA FAST-DRI Core Oils have excellent flowability resulting in better workability in core boxes.

The uniformity of DELTA 155-X and 168-X FAST-DRI Core Oils is guaranteed. The chemical and physical constants are maintained by strict laboratory control.

DELTA

Working samples for test purposes together with complete data are available to you. Included, also, will be information on other Delta Core Oils, Delta Dri-Bond and DELTA BONDITE. Your request will receive immediate attention.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

TROUBLE-FREE OPERATION

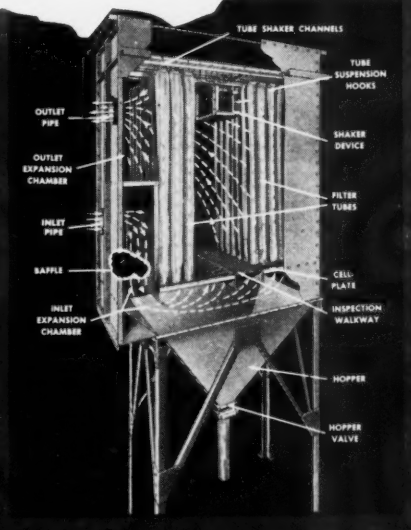
"The Dustube is certainly the least expensive of all dry type collectors to operate and maintain, and I can go one step farther and say that the Dustubes are the most trouble-free units in our whole plant."

Mr. James Reddrick—Supt. of Maintenance
The Oliver Corp.

ECONOMICAL AND DEPENDABLE

"We have found them to be most economical and most dependable. They can't be beat for efficiency and they cost just a few pennies a day to operate."

Mr. L. D. Reiff—Asst. General Manager
Superior Steel & Malleable Castings Co.



OUTSTANDING PERFORMANCE

"The performance of the Dustube has been so outstandingly satisfactory that I must admit its continual high efficiency and low cost operation is taken for granted."

Mr. C. L. McWhorter—Foundry Foreman
Majestic Co.

metal working users agree:

"IT PAYS TO OWN A DUSTUBE® COLLECTOR"

COMPLETELY FREE OF DUST

"Our Dustube Dust Collector has given us so little trouble that were it not for the fact that our cleaning room is so completely free of dust, we would have forgotten that it is there at all."

Mr. Dale Ward
Cleaning Room Supt.
American Malleable Castings Co.

DIRECT CASH SAVINGS

"Their efficiency and cost-saving performance return direct cash savings which will pay us a profit for many years to come."

Mr. C. Schwalje—Supt. of Foundries
Worthington Corp.

DUST COUNT PROVES EFFICIENCY

"The state health department recently made a dust count in our foundry and reported that we had one of the lowest counts of all foundries in the State."

Mr. Lawrence Perry—Foundry Supt.
Liberty Foundries Co.

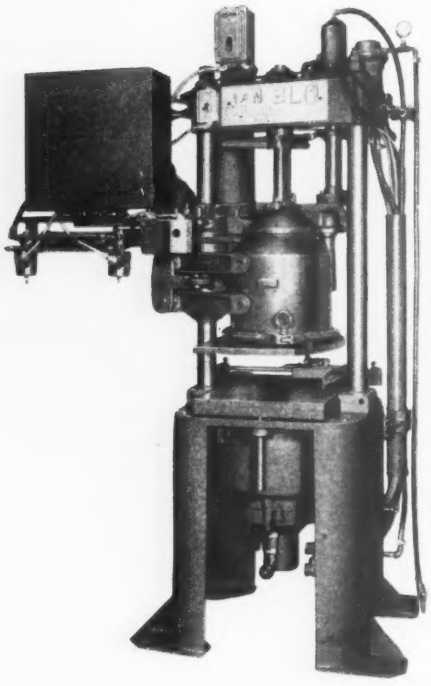
American dustube® COLLECTORS

WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St., Mishawaka, Ind.

Send for Bulletin No. 392

there's a SAN

All "40" model SAN-BLO's will blow cores weighing from ½ lb. to 40 lbs. each—using any core sand mixture capable of hand-ramming—with moisture content to 8%, green strength to 12 p.s.i.—using one standard sand magazine for all jobs.

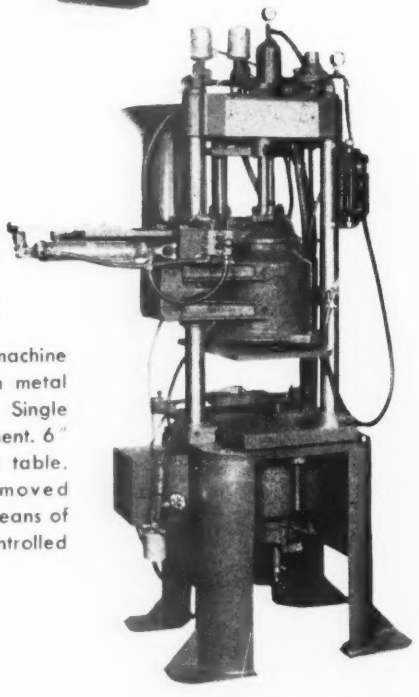


MODEL 40-D-9

For fastest production of cores in metal core boxes. All operations automatically controlled and timed—blow cycle, core drawing, sand magazine refilling. A single starting button controls entire operation.

MODEL 40-DD

This machine performs the same functions as the full-automatic model, but all operations are manually controlled. 6" stroke, clamp-draw table. Sand hopper refilled from floor



PULSATOR MODEL 40-P-2

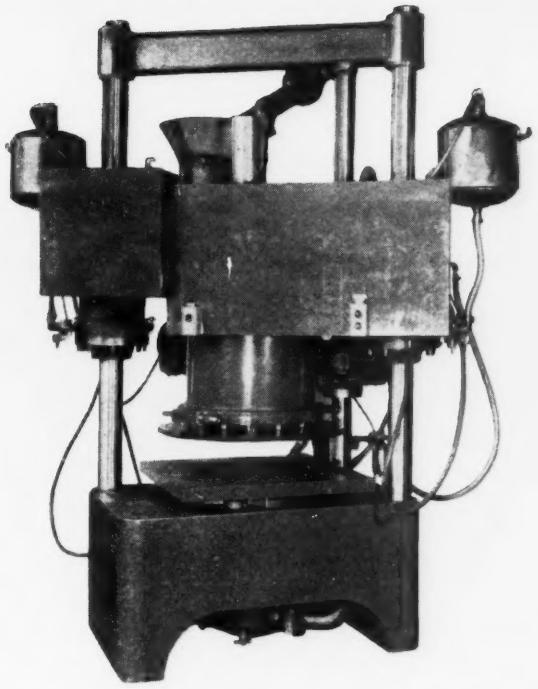
The all-purpose machine that blows cores in metal *and* wood boxes. Single control, fast adjustment. 6" stroke, clamp-draw table. Sand magazine moved under hopper by means of an air cylinder, controlled by hand valve.

MODEL 40-D-1

This model, also for metal boxes, is similar to the 40-DD described above, plus automatic control of the blow cycle. A push button starts the blow cycle and an electric timer controls its length.

There are 29 other SAN-BLO models available, offering a wide variety of controls and features, to suit your specific requirements.

BLO to meet your requirements . . .



PULSATOR MODEL P-150
FOR CORES TO 150 LBS.

PULSATOR MODEL P-250
FOR CORES TO 250 LBS.

These two models, for blowing cores weighing from 5 lbs. to 150 lbs. and 5 lbs. to 250 lbs., have all the features of the 40 model PULSATOR, plus additional controls and features necessary for blowing large cores in metal *and* wood core boxes. Entire operation is completely automatic and controlled by a single push button. Sand magazine refilled automatically and adjusted to box height hydraulically. Roller conveyor may be used at rear or side of machine, to facilitate moving core boxes in and out.

Write for full details

"SERVING THE FOUNDRY INDUSTRY
FOR FORTY-FIVE YEARS"

FEDERAL

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The **FEDERAL FOUNDRY SUPPLY** *Company*

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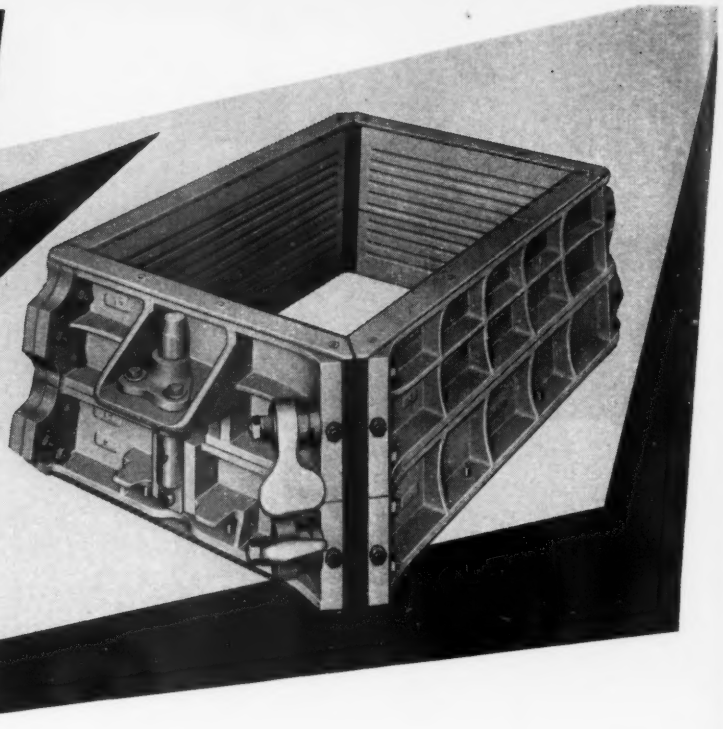
SALES OFFICES: CHATTANOOGA · CHICAGO · DETROIT · LOS ANGELES · MILWAUKEE · NEW YORK

TWICE AS STRONG
A Third Lighter



—that's why magnesium is so popular for flask construction...

Magnesium has twice the tensile strength of aluminum, thus assuring longer service, and magnesium weighs 1/3 less than aluminum, making for easier handling.

FREMONT MAGNESIUM FLASKS

with their accurately machined inside surfaces and flanges and steel-faced top and bottom flanges, assure more exacting work.

THE NEW FREMONT SPREADLOCK FLASKS

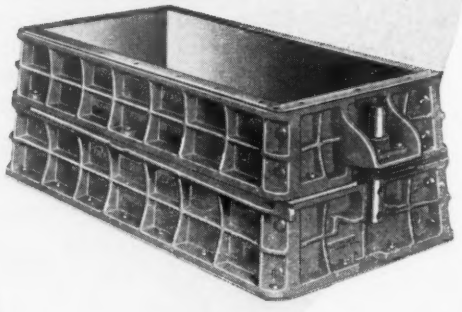
have long-life, easily replaceable, live-rubber corner inserts which completely close the corner gaps so that no sand can lodge in the open corners.

PERFECT ALIGNMENT INDEFINITELY!

is guaranteed by the one-inch GROOVLOCK FOOLPROOF PIN on

FREMONT STANDARD SLIP FLASKS

Particularly adapted to cope or drag pattern jobs. Solid, bolted and welded corner construction. Other types of standard pin fittings also available.



THE FREMONT FLASK COMPANY

FREMONT, OHIO

Write today for free literature and prices. All orders given prompt attention.

How to STEP UP PRODUCTION

with CARBORUNDUM's Abrasive Belts

This **FREE** booklet shows you how!

● This new booklet by CARBORUNDUM will help you determine what grinding jobs you may be able to do better with abrasive belts...and give you the facts you need to make your present belt grinding operations more profitable.

Actual case histories—complete with photographs, facts and figures—show you the way many companies have increased production and lowered costs by switching to CARBORUNDUM's abrasive belts and contact wheels. In some cases the change was to belts from grinding wheels or set-up wheels; in others, the change was made from other types of belts and contact wheels to those by CARBORUNDUM.

USE THE COUPON

to send for your copy today. And call your CARBORUNDUM distributor or salesman—he's ready to help you step up production, cut costs.

THE CARBORUNDUM COMPANY, Dept. F 82-316
Niagara Falls, New York

Please send me a copy of "Abrasive Belts by CARBORUNDUM."

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COMPANY _____

STREET AND NUMBER _____

CITY _____ ZONE _____ STATE _____

☐ I'd also like a FREE copy of the "COATED ABRASIVE SELECTOR"

CARBORUNDUM

TRADE MARK

...the ONLY source for EVERY abrasive product you need

"Carborundum" is a registered trademark of The Carborundum Company, Niagara Falls, N. Y.

82-316

Have the

"TOUCH OF GOLD"

when you grind steel castings

Rely on Norton ALUNDUM wheels*

The right Norton wheel on the job gives you the "Touch of Gold" . . . that sense of adding value to the product every time the wheel turns . . . and adding to your own profit by doing the job the fastest, most efficient way.

Whether you use swing frame, floor stand, or portable grinders to rough-grind your steel castings, there's a Norton ALUNDUM wheel that's right for the job.

Get help in selection from your Norton distributor and abrasive engineer. Get the right answer for such variables as: the condition and type of the casting . . . area of wheel contact . . . amount of pressure applied and heat generated . . . . type of grinding machine used.

And, you'll find out which ALUNDUM abrasive to use for your cleaning room jobs and which of the several outstanding Norton bonds (BH, R5 and B7 resinoid for high speeds and BE for slow speeds) to use for best results.

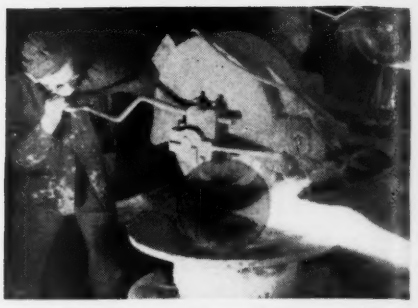
Free 48-page booklet, "Rough Grinding," fully illustrated. Ask your nearby Norton Distributor for Form 1405 or write us direct. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

NORTON

ABRASIVES

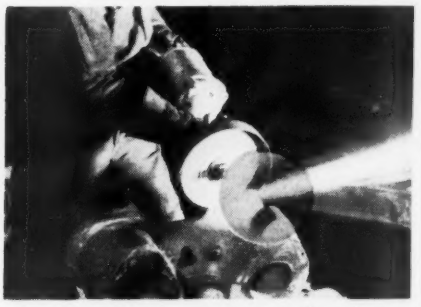
Making better products to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

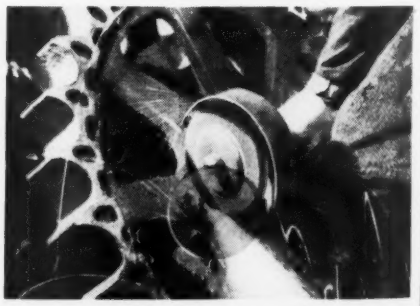


Be sure of fast cutting action . . . without sacrificing wheel life from Norton ALUNDUM wheels with resinoid bonds. They give you the "Touch of Gold."

Get twice the efficiency from your floor or bench grinders by using Norton ALUNDUM wheels on both ends of your machines.



Snag steel castings with portable grinding machines, using fast-cutting Norton ALUNDUM wheels.

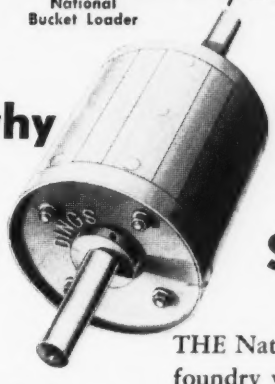


You get the "Touch of Gold" when you use Norton wheels. Shown here, Norton ALUNDUM wheel grinding a sprocket at a fast rate.

Step up rate of stock removal from steel castings by use of pressure bar on floor stand grinders . . . keep handling time to a minimum.

Growing Foundries keep a Scottish eye on costs

...that's why there's a Dings Magnetic Separator on National's New "Utility" Sand Conditioning Unit



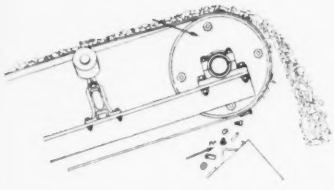
Dings Magnetic Pulley

THE National Engineering Utility unit is engineered for the small to medium-sized foundry with big plans. It screens, mulls, aerates and magnetically separates sand for re-use with a minimum of hand operations—offers big foundry mechanization at small foundry cost.

Foundrymen will appreciate the built-in Dings magnetic separator—now regarded as essential equipment by most operators. This Dings Magnetic pulley will soon pay for itself in several ways; it eliminates iron contamination, improving sand and casting quality; it reclaims valuable scrap metal; and reduces maintenance and repair costs on other preparation equipment.

When you're purchasing sand preparation equipment remember these advantages. There's a Dings Magnetic Separator to do this work in foundries of any size. Get acquainted with the Dings line—*write for* CATALOG C-5000-B, *today.*

HERE'S HOW THE MAGNETIC PULLEY WORKS—



SAND FLOWS over pulley crown in normal trajectory. Magnetics are held fast to belt by magnetic pull, discharged separately.

Dings
MAGNETS

DINGS MAGNETIC SEPARATOR COMPANY
4708 W. Electric Ave., Milwaukee 46, Wis.

PLEASE SEND ME CATALOG C-5000-B.

Name_____

Title_____

Firm_____

Address_____

PPU-153

TRAMRAIL COVERAGE *SPEEDS* FOUNDRY PRODUCTION

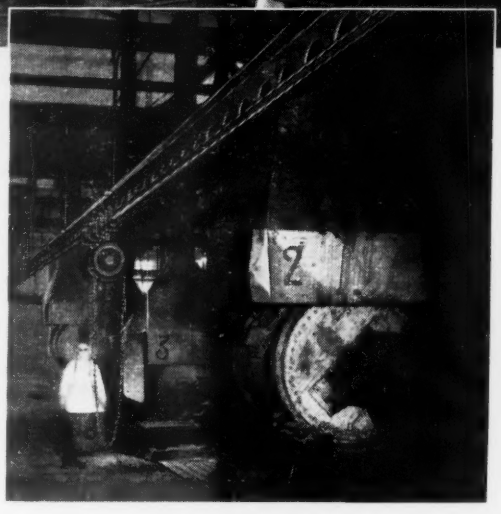
Jobbing Foundry Cuts Costs with Hand-Propelled System

Metal is quickly transferred to the hand-pouring ladles. This Cleveland Tramrail system is completely hand-propelled. Gray iron, aluminum, magnesium, brass, bronze, and monel castings are produced in this jobbing foundry.

When one considers that as much as 250 tons of materials must be moved to produce one ton of finished castings, depending on casting size, the importance of easing and speeding foundry handling is self-evident. Saving just one minute on every ton handled will reduce production time by over four hours.

Cleveland Tramrail equipment enables such tremendous time savings that frequently the output of a plant is increased by 25% to 100% without adding an additional foot of floor area.

Why not give Cleveland Tramrail a trial in your foundry? A representative will be glad to give you the details.



Bull ladles with hot metal from these electric furnaces are easily conveyed on the overhead Tramrail directly to the pouring floor.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3831 East 286th Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

"I don't know anything about fancy claims. I've heard how this abrasive's better or that one's cheaper—but all I know is what I see. We use Malleabrasive in our shop and that's one abrasive I'll swear by. It cleans fast and does a good job—you can see the castings shine when they're done. Malleabrasive lasts longer and is easier on the machine, too, so we don't have to stop so often for abrasive refill or parts repair. That means we get more work out. Our shift foreman says that's why Malleabrasive is cheaper in the long run. One thing's sure—we're all sold on Malleabrasive."

Pangborn

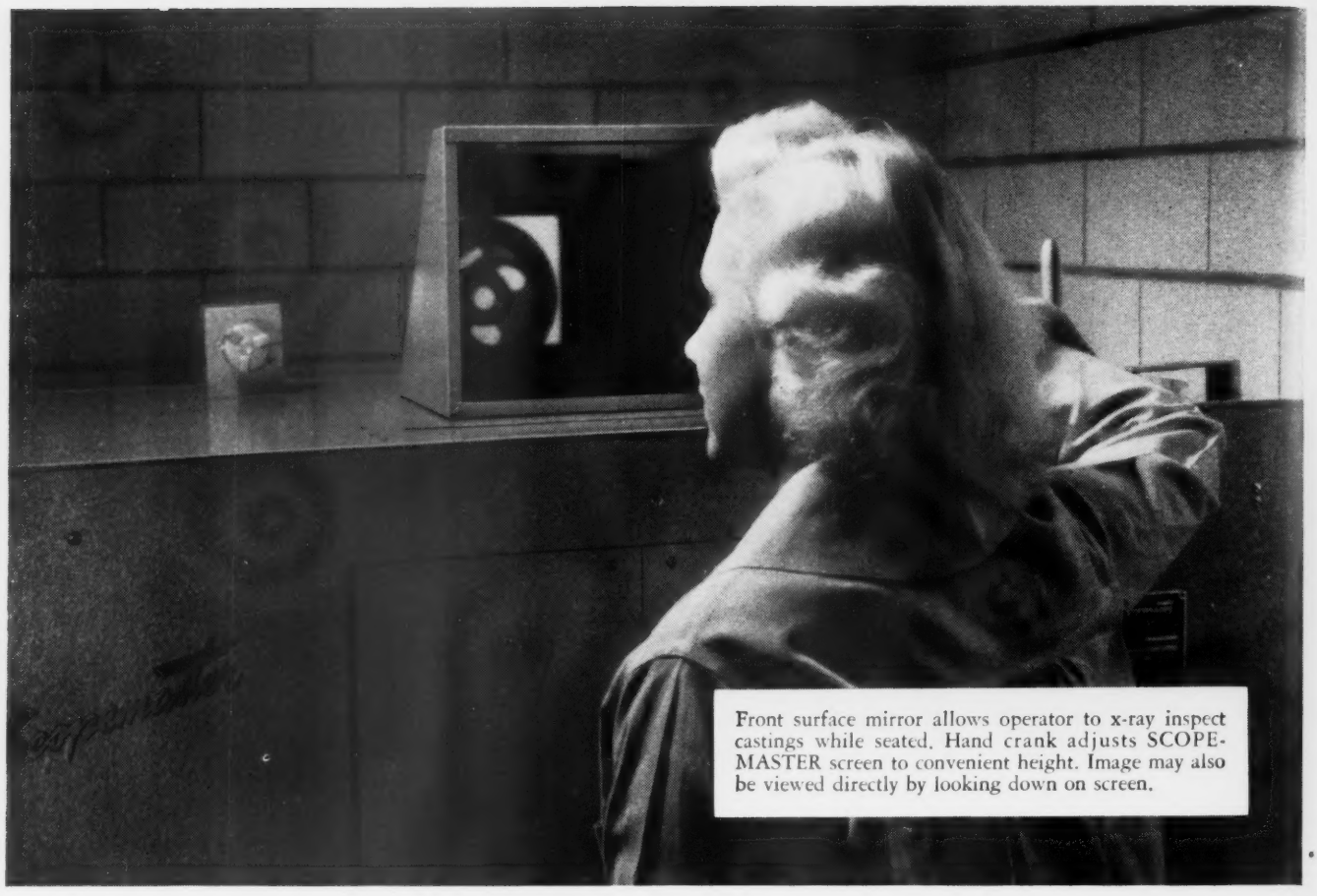
DISTRIBUTORS FOR

MALLEABRASIVE

U. S. Patent #2184926
other patents pending

Next time you order abrasive, specify Malleabrasive from Pangborn Corporation, 1400 Pangborn Blvd., Hagerstown, Md.

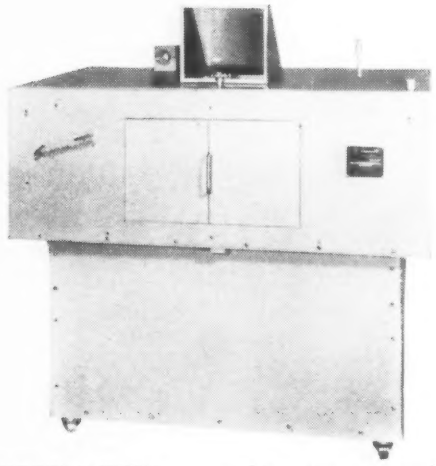
Pangborn BLAST CLEANS CHEAPER with the right equipment for every job



Front surface mirror allows operator to x-ray inspect castings while seated. Hand crank adjusts SCOPEMASTER screen to convenient height. Image may also be viewed directly by looking down on screen.

Reduce costs! Use GE Scopemaster for 100% visual x-ray inspection

Provides more than ample sensitivity in high-speed examination of light-metal castings, molded plastics, intricate assemblies, etc.



SCOPEMASTER's screen-object distance can be varied to magnify image, and a single control moves the sample longitudinally or transversely. Unit is fully protected for stray radiation.

100% fluoroscopic x-ray inspection can prove a valuable tool in your plant. Pioneered for the aircraft industry, the GE SCOPEMASTER saves producers and users of light metal alloy castings time and money in catching defective parts. The accuracy of its inspection is attested by its use on airframe castings where failure could cause a serious accident. It is vastly superior to sample inspection by other means, and costs are far lower than with any other method of comparable thoroughness.

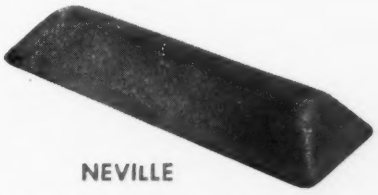
Other jobs on which x-ray fluoroscopy has been successful include checking small electrical components for incomplete or improper assembly. In the molded plastics industry, it has helped establish manufacturing technics. And in the production of small ordnance items, it replaced destructive spot tests — salvaged 90 to 98% of lots that previously would have been rejected in their entirety.

The SCOPEMASTER is another example of how General Electric is harnessing x-ray to the needs of industry. If there's a testing or inspection trouble spot in your plant, x-ray may be the answer. Ask your GE x-ray representative for an evaluation, or write your requirements to X-Ray Department, General Electric Company, Milwaukee 1, Wisconsin, Rm. 1 1-6.

GENERAL ELECTRIC

Westinghouse Air Brake uses Neville Pig Iron for Uniform Quality

ONLY the best materials can be used in making the products for the nation's busy railroads. For many years, the Westinghouse Air Brake Company has employed Neville Pig Iron in its complex air brake castings. We'll be glad to discuss *your* pig iron requirements . . . today, or at your convenience.



NEVILLE
Quality Pig Iron for the Foundry Trade

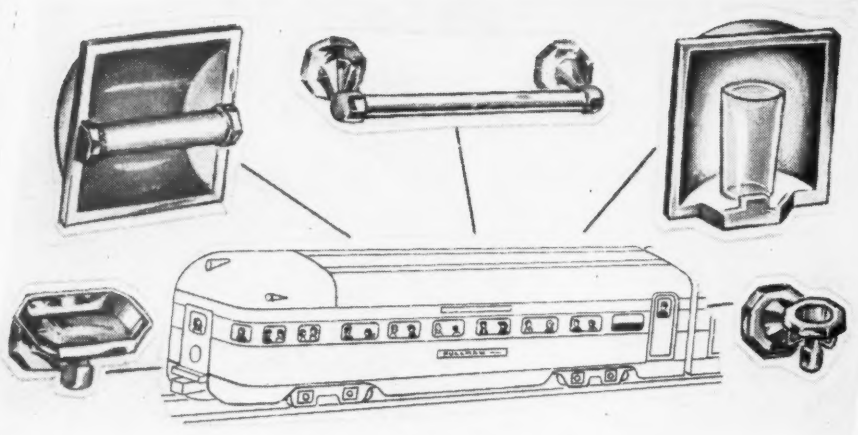
W&D 4692

PIG IRON DIVISION
PITTSBURGH
COKE & CHEMICAL CO.
Grant Building • Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

WHY *Nickel Silver* CAN BETTER SERVE YOUR NEEDS . . .

RICHNESS OF APPEARANCE



NICKEL SILVER CASTINGS ARE A MUST WHERE APPEARANCE IS AN IMPORTANT FACTOR . . . .

This alloy's silver like appearance and resistance to tarnishing makes it adaptable for hardware furnishings in trains, lavatories; wherever appearance and durability are required.

Good machinability, excellent pressure tightness, favorable casting characteristics and polishing qualities are the many properties required by manufacturers.

FREE . . . Write for your copy of the 8-page Lavingot Technical Journal — Vol. 9, No. 1 — containing an article discussing "Silicon Bronze."

Specify—LAVIN NONFERROUS INGOT—*Quality*

Brass · Aluminum · Bronze · Zinc Base Die Casting Alloys

R. LAVIN & SONS, INC.

- *Refiners of Brass, Bronze and Aluminum*
- *Producers of Zinc Base Die Casting Alloys*

3426 S. KEDZIE AVENUE • CHICAGO 23, ILLINOIS

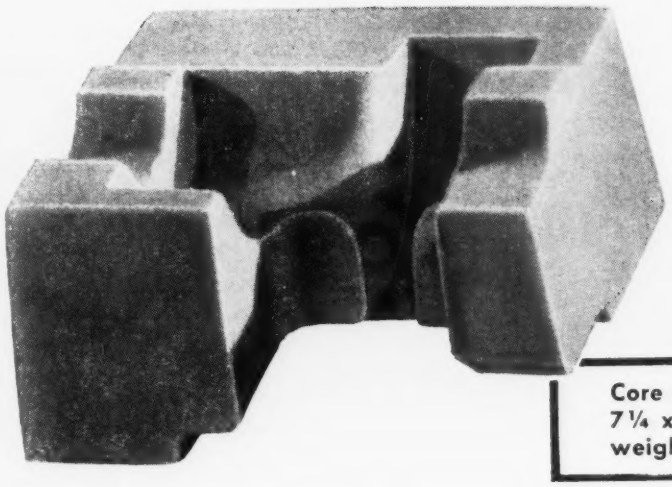
REPRESENTATIVES IN PRINCIPAL CITIES

R. LAVIN & SONS, INC. 1900 53 Years 1953 SERVING THE FOUNDRY INDUSTRY

Foundromatic Dryer Dries Core in

3 Minutes...

Takes 70 Minutes in Conventional Oven



Core measures: 7¼ x 6¾ x 4, weighs 7 pounds.

WITH THE *Foundromatic* dryer you not only slash core *baking* time, but you reduce core *handling* time by eliminating:

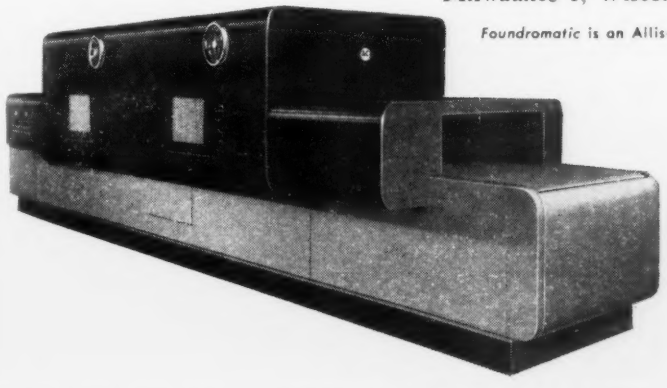
1. **Collecting Rack**
2. **Cooling Rack**
3. **Storage Rack**

Cores can go directly from the *Foundromatic* dryer to the molder. They are cool, dry, ready-to-use the moment they come out of the dryer.

In addition, these cores have excellent shakeout characteristics and a smooth finish that means better castings. Fuel costs are lower, too, because no energy passes between the electrodes when there are no cores in the oven. No overbaking either! A core left in the oven all day will not burn.

Find out more about the time- and money-saving *Foundromatic* Core Dryer by calling your nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3891

Foundromatic is an Allis-Chalmers trademark.



ALLIS-CHALMERS

FOUNDROMATIC *Dielectric* **SAND CORE DRYER**

QUESTIONS and ANSWERS

About Dielectric Sand Core Drying

1. *How much savings can I expect with the* Foundromatic *core dryer?*

   Estimated savings of 55% to 70% have been reported.

2. *Do I need an electronic engineer to help me?*

   No. Once equipment is installed and operating, any personnel can be quickly trained to follow operating instructions.

3. *How much maintenance is there?*

   Very little. Periodic oiling of conveyor and blower motors and rollers; and replacement of tubes.

4. *How long must we wait after cores pass through dryer before they can be used?*

   Cores can be used immediately.

5. *Does the* Foundromatic *core dryer use power when empty?*

   No. Dielectric heaters inherently deliver no power unless the material is between the electrodes.

6. *Will light sections burn if dried with heavy sections?*

   No. Cores will not burn in the *Foundromatic* core dryer.

7. *What about collapsibility?*

   Resin bonded cores have very good collapsibility, contributing to a faster, cleaner shakeout.

SEND

Allis-Chalmers A-3891
Milwaukee 1, Wisconsin

Please send me new 8-page booklet 15B7306B containing complete information on the *Foundromatic* sand core dryer.

Name .....
Title .....
Company .....
Street .....
City State

IF BETTER MOLDS CAN BE MADE, YOU CAN MAKE THEM WITH

NATIONAL BENTONITE

WHY IT'S FIRST CHOICE WITH MANY GOOD FOUNDRYMEN:

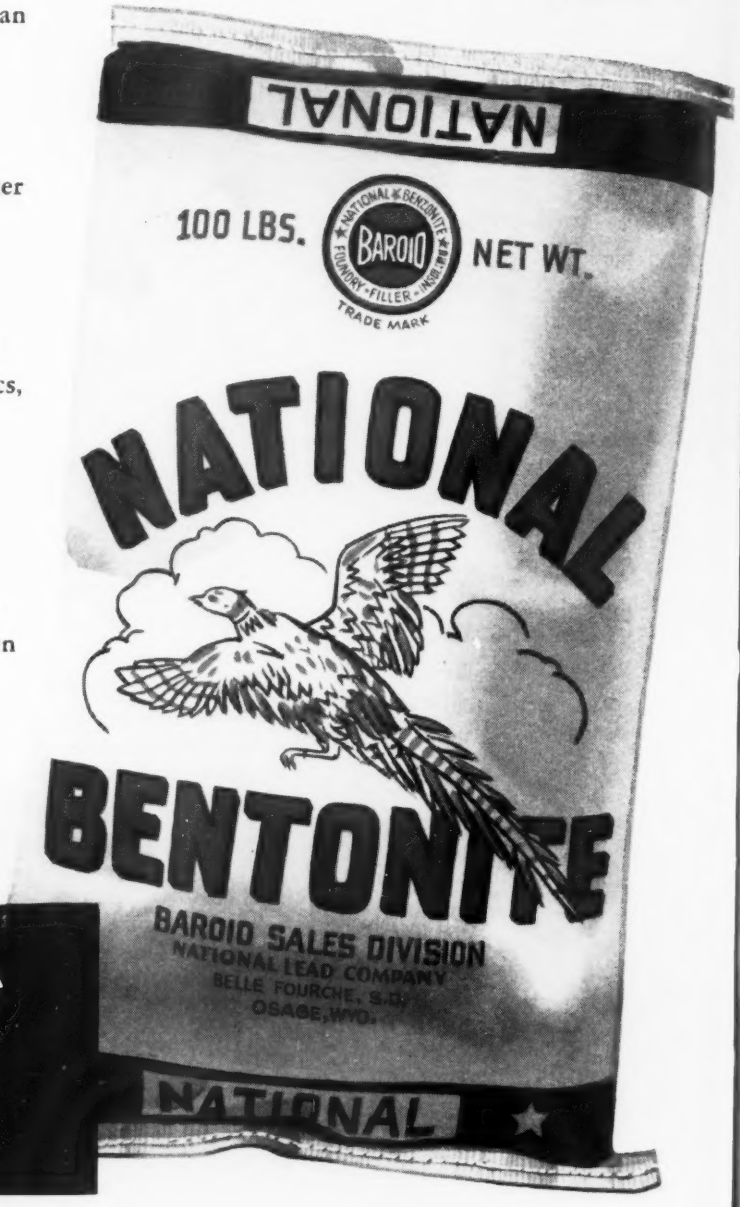
Consistently uniform high quality • Good green strength • High hot strength • High tensile strength • Yields high permeability • Provides high deformation • High sintering point • Requires least water to temper correctly • Good mold durability • Close laboratory control

Among good foundrymen, you'll find many an experienced man who prefers National Bentonite for bonding because he knows he can depend on the many properties it offers to provide a superior bond . . . which means, in terms of better production, better castings which require less time in the cleaning room.

Proper moisture control being one of the most important factors in good mold characteristics, it's always best to use a bonding material that requires the least amount of water to temper correctly. Foundrymen have found that they can control their moisture content correctly with proper proportions of National Bentonite in their molding sand. That's why so many good foundrymen say, "I can rely on National Bentonite."

FIRST CHOICE WITH MANY GOOD FOUNDRYMEN FOR YEARS

Quick Service From Better Foundry Suppliers Everywhere

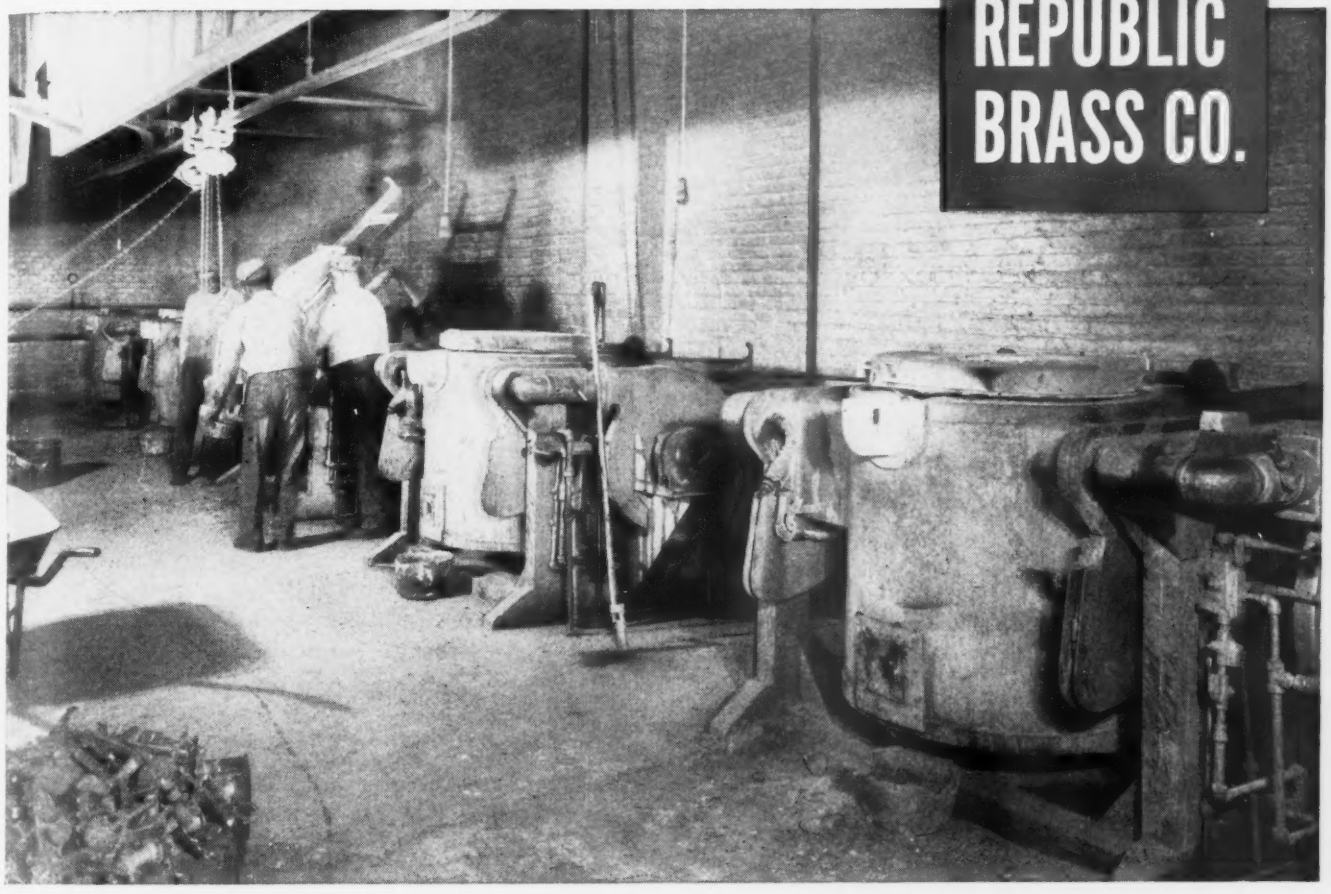


Baroid

Baroid Sales Division ★ National Lead Company
Bentonite Sales Office: Railway Exchange Building, Chicago 4, Illinois

6 LINDBERG-Fishers for 6 years

and all's well at REPUBLIC BRASS CO.



LINDBERG-Fisher BRASS MELTING FURNACES STAND THE GAFF

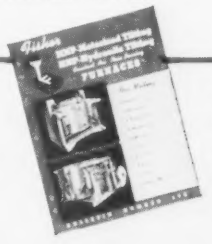
All's well at The Republic Brass Co., (Division of Briggs Mfg. Co.), Cleveland, Ohio—manufacturer of water faucets and related plumbing fixtures. In 1945, as part of a modernization program, Republic installed six Lindberg-Fisher brass melting furnaces. These oil fired, constant arc, nose-pouring furnaces have more than withstood the test of time . . . and maintenance has been almost nil.

Here's what Mr. J. J. Smith, Republic's foundry superintendent thinks of his six Lindberg-Fisher brass melting furnaces:

"We have had six Lindberg-Fisher brass melting, nose-pouring, 1200 pound capacity furnaces for six years, and have had very good results from them . . . they deliver more than 100 heats per crucible . . . one hour twenty minutes per heat . . . 18 months lining life. They have performed very satisfactorily as to upkeep, and we have had excellent operating results."

Check these advantages of Lindberg-Fisher Hydraulic Nose-Pouring Melting Furnaces

- Constant pouring arc regardless of degree of furnace tilt.
- Rate of pouring always under positive and constant finger-tip control.
- Special trunnion mounting permits lower construction than hand tilting furnace.
- Reduced height facilitates charging cold metal, and observation of metal.
- Metal waste and pouring hazard greatly reduced by closeness of ladle to pouring spout.
- Labor saving . . . simple control enables one man to pour and transfer metal.



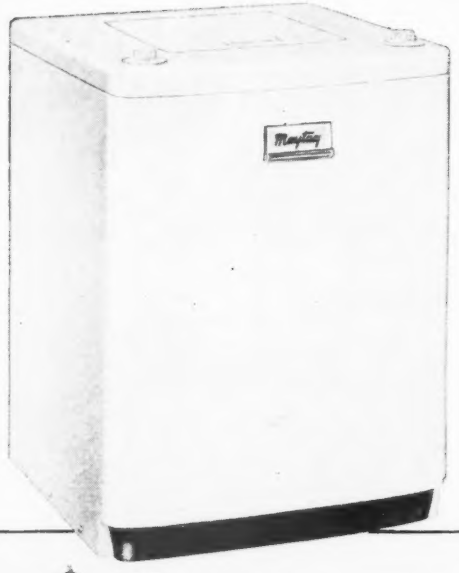
Write for Bulletin No. 57-A for more information on MNP-Motorized Tilting and HNP-Hydraulic Tilting Constant Arc Nose-Pouring Furnaces.

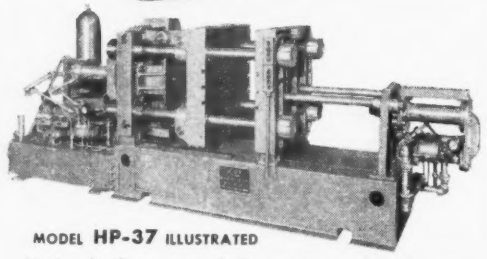
LINDBERG-Fisher MELTING FURNACES

Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois

KUX

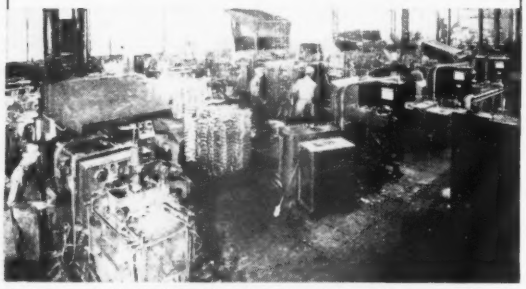
FIRST NAME IN DIE CASTING MACHINES





MODEL **HP-37** ILLUSTRATED

Hydraulically operated die casting machine for production of aluminum castings.



Battery of KUX Die Casting Machines in operation in the ultra-modern Maytag factory at Newton, Iowa

—helps make

Maytag

first name in washers

Since 1907, over 6 million Maytag Washers have been sold—far more than any other. The reason's clear; Maytag makes a wonderful washing machine . . . plus a full line of other home laundry equipment and famous Dutch Oven Ranges. It's logical that KUX, first name in die casting machines, should be used in the quality production of these superior products.

The use of KUX die casting equipment can put YOUR PRODUCT ahead—or *keep* it ahead. Reduce your manufacturing costs—increase the saleability of your product, with quality die castings made on these rugged machines.

Write for illustrated catalog showing complete line of KUX Die Casting Machines

KUX MACHINE COMPANY
6725 N. Ridge • Chicago 26, Illinois

KUX

FIRST NAME IN DIE CASTING MACHINES
SELECTED BY FIRST NAMES IN INDUSTRY

Here is a typical problem. . . . Ingersoll-Rand Air Motors solved this tough control problem in a paper mill. Since steam and acid conditions prevailed, manual operation of digester dump valves was extremely dangerous. These conditions also prevented satisfactory use of electric motors and controls. Size 55SM Air Motors were installed, dumping was controlled from the charging floor 50 feet above the dump valves, and stand-by valve crews were no longer necessary, due to the reliable, trouble-free operation of the Ingersoll-Rand Air Motors.

When wide ranges of operating speeds are desired . . . when instantaneous starting and stopping is needed . . . when the motor will be subjected to frequent stalling and overloads . . . when wet, acid, or explosive atmospheres, or high temperatures make operations too hazardous for direct manual control . . . when expensive and complicated protection devices would otherwise be required . . . when compact motor units are essential . . . and finally, when installation and maintenance costs must be kept low . . . the Ingersoll-Rand Air Motor is the answer to the problem.

Write, wire, or phone your nearest Ingersoll-Rand branch office for help with your tough control and drive problems . . . or request the new Air Motor Bulletin, Form 5072, which gives full information on over 110 sizes of Air Motors . . . both Piston and Multi-Vane types . . . speeds from 5400 to 19 r.p.m. . . . from 1 to 24 H.P. . . . or request information on fractional horsepower Air Motors.

Ingersoll-Rand

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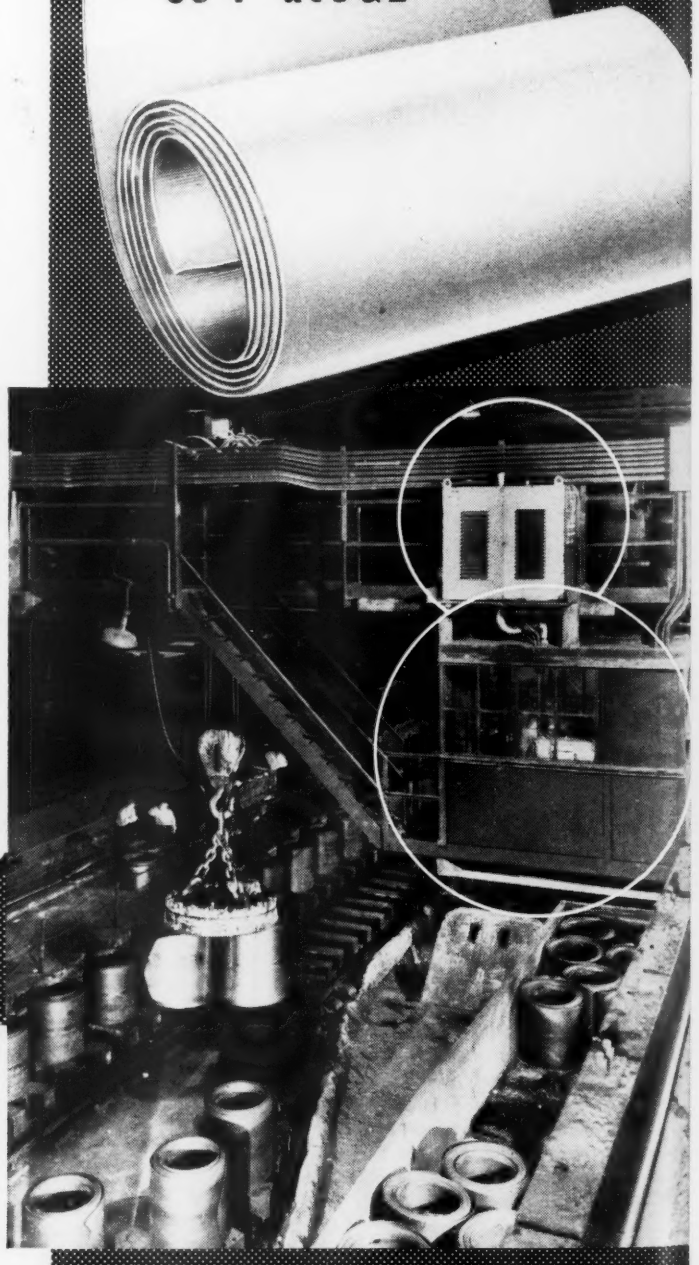
DRAVO

split-type crane cab cooler reduces cab temperatures 65°F at J&L



Crane operators working with hot coils of sheet steel at Jones & Laughlin Steel Corporation's Cleveland Works were subjected to ambient temperatures of 150°F . . . until a Dravo Split-Type Crane Cab Cooler was installed on the crane.

Now temperatures inside the cab have been reduced to 80-85°F, providing crane operators with healthier working conditions, making them more efficient and alert and reducing the possibility of accidents.

Because of the limited space available on the crane, the condensing section was mounted on the bridge and the evaporator section was placed in the cab itself. The two sections are joined by refrigerant piping, eliminating the need for a bulky duct system.

Dravo Crane Cab Coolers filter the air, remove dust, dirt and fumes; provide heat in winter, cool air in summer, and constant ventilation the year around. They are easily and quickly installed on any type crane with a minimum of crane down-time required.

Dravo Crane Cab Coolers are available now in both split-type and self-contained units. Write for more information—or call the nearest Dravo Office and have our representative call on you. Ask for Bulletin No. QX 130 - 5

DRAVO
CORPORATION
Air Conditioning Department
Dravo Building, Fifth and Liberty Avenues
Pittsburgh 22, Penna.

ATLANTA • BOSTON • CHICAGO • CINCINNATI
CLEVELAND • DETROIT • INDIANAPOLIS • NEW YORK
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AQUA-SET

A SYNTHETIC CORE BINDER

LIQUID OR DRY

PAYS OUT 4 WAYS

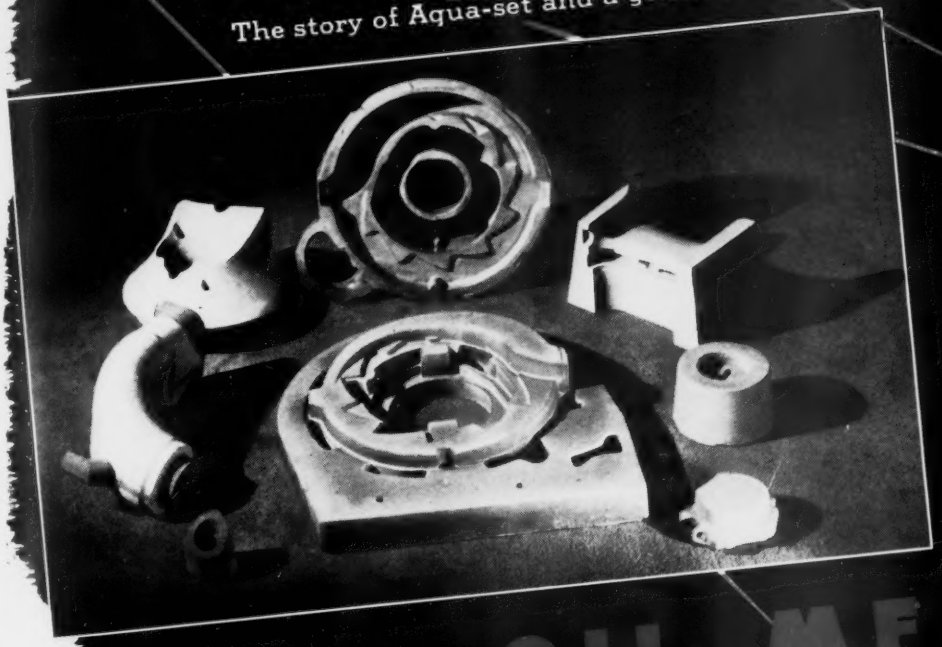
1st Aqua-set is not an oil type binder. Most of the oven time needed to oxidize a conventional core oil is saved in baking Aqua-set cores.

2nd Most of the fuel required to keep ovens up to high temperatures for long bakes is saved since Aqua-set cores are done when thoroughly dried of moisture with oven heat, and only temperatures of 300°F to 350°F are required.

3rd Most of the cleaning room costs can be saved since Aqua-set cores will turn to sand on pouring and will flow freely from castings.

4th Aqua-set pays out with a plus value in finer castings, and that means castings made from all types of metal.

The story of Aqua-set and a generous sample are yours for the asking.



UNITED OIL MFG. CO.

1429 WALNUT STREET • ERIE, PA.

Photo courtesy: Cooper Alloy Foundry Co

Reclaim—for shell mold economy

Shell molding sand can be reclaimed to "good-as-new" condition economically, quickly. The simple, one unit Nichols high temperature sand reclamation system completely removes organic matter from used sand. No water disposal problem. Drastically reduces new sand costs.

Write for Bulletin 222.

Nichols Engineering & Research Corp.
70 Pine St., New York 5, N. Y.
1920 N. Meridian St., Indianapolis 2, Ind.
40 S. Los Robles Ave., Pasadena 1, Calif.
1477 Sherbrooke St., W., Montreal 25, Canada

Nichols

Sand Reclamation Systems

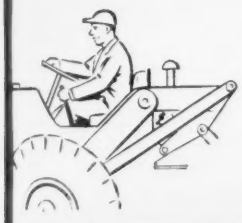
faster work cycle...
higher output...
lower maintenance

these are advantages you get with

TORQUE CONVERTER LOADING

brought to you by the

TL-10 TRACTO-LOADER



SINGLE LEVER CONTROL speeds work cycle and output. No gear shifting on most loading jobs. Two multiple disc clutches are built right into the transmission. One is for forward, the other for reverse. Both are operated by simply pushing or pulling a single lever. Reverse is almost twice as fast as forward.

HIGHLY MANEUVERABLE Bucket over drive wheels utilizes weight of load for greater traction . . . eases weight on rear steering wheels for fast maneuvering. Turning radius is only 11 ft. at tip of bucket . . . works where smaller machines are normally used.

NO RAMMING, NO BUTTING, NO ENGINE STALLING when you get your load with the TL-10 Tracto-Loader. You crowd steadily into the pile, using only the foot throttle and bucket control levers — wheel spinning is practically eliminated. That's because the torque converter drive is constantly and automatically adjusting forward speed against loading resistance. This means faster loading, less strain on equipment and greatly reduced tire wear.

What's more, bucket action is always snappy and powerful, because speed of engine and hydraulic pump is never dragged down — even when forward motion is stopped.

Ask your Allis-Chalmers industrial tractor dealer to tell you of the many additional Tracto-Loader features. Better yet, let him give you a practical demonstration. When you see the advantages of torque converter loading on your job, you'll know what we mean when we say:

Never-Anywhere-
A WHEEL LOADER LIKE THIS!

-10 TRACTO-LOADER
46 brake hp. — weight 11,400 lb.
Four speeds forward and reverse
your nearest Allis-Chalmers Industrial Tractor Dealer.

TRACTOMOTIVE
TRACTOMOTIVE CORPORATION, DEERFIELD, ILLINOIS

PERFECT SURFACE IS A "MUST". . .

Large drying rolls, like the one below receiving its final polishing pass, are used in "Yankee Dryer" paper-making machines which turn out soft facial tissue. Even slight surface flaws in these eight- and twelve-foot diameter castings cause them to be rejected.

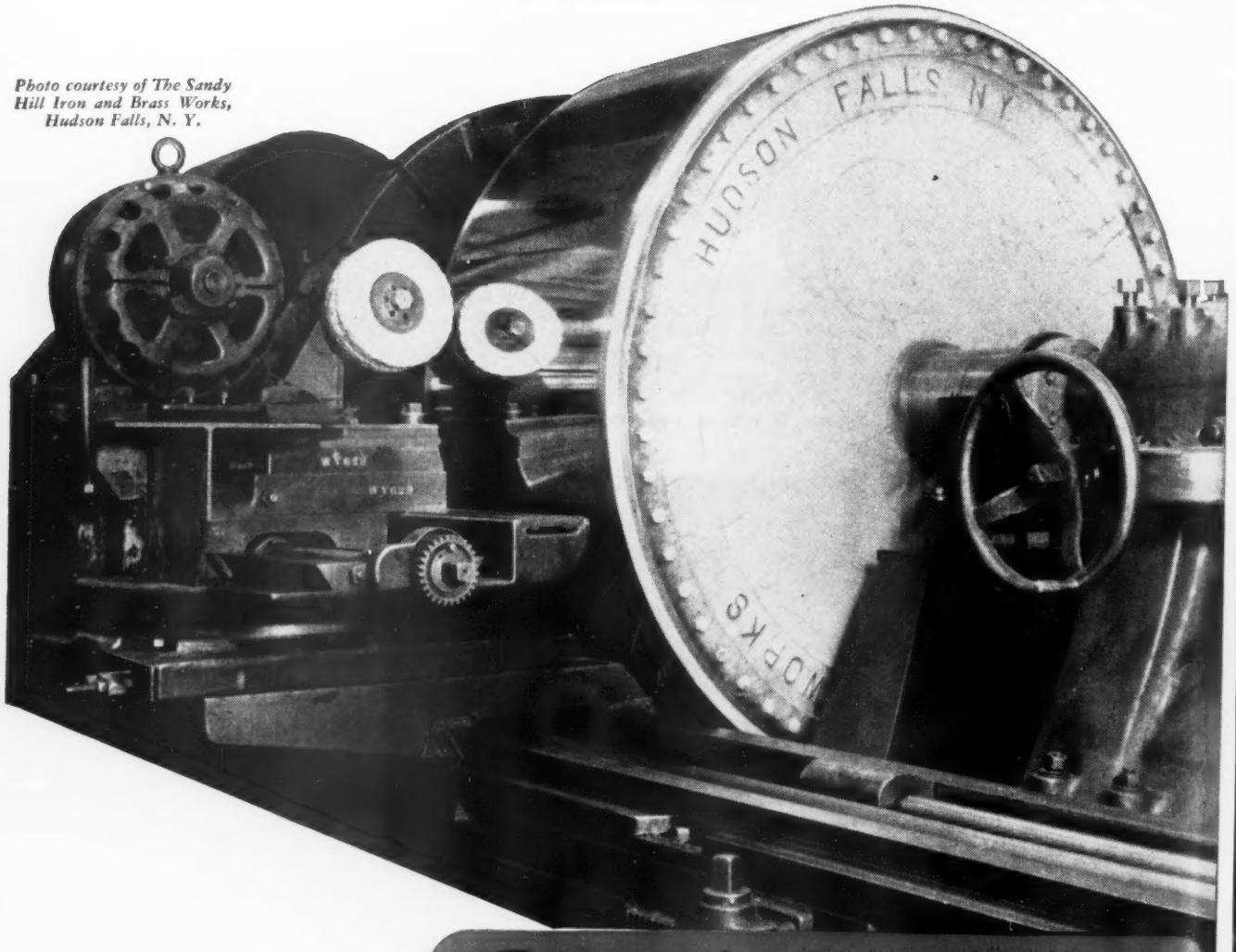
So they use CHATEAUGAY PIG IRON

. . . the low-phosphorus, copper-free pig iron that has eliminated scrap losses in countless "tough casting" jobs. With CHATEAUGAY, consistently uniform "physicals" assure predetermined fine grain structure throughout every casting, regardless of size or shape.

Whatever the requirements of your castings—if ordinary pig iron won't do the job—NOW is the time to investigate the *exclusive* advantages of premium CHATEAUGAY. A Republic Pig Iron Metallurgist will be glad to give you the complete facts at your convenience. Write today to:

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

Photo courtesy of The Sandy Hill Iron and Brass Works, Hudson Falls, N. Y.



Republic PIG IRON

"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

REPUBLIC STEEL

5 ways you save costs with Plaskon resin core binders

Plaskon Resin Core Binders can bring you savings in time and money on the casting of all metals.

Here are 5 important qualities that speed production and lower costs:

1 Increased Oven Capacity—Lower Fuel Costs:
Just enough heat to thoroughly dry out the cores is sufficient to set the resin, so that no extra baking is necessary.

2 Less Rejects—Closer Tolerances:
During casting, no tars are formed to clog vents and reduce the permeability of the sand. This reduces blows, gas holes and porosity to a minimum and permits the use of finer grain sand, yielding better detail and casting finish.

3 Lower Shakeout Costs:
After casting, the binder is sufficiently burned out, so that the sand readily shakes out of the most intricate passageways. Cracks and hot tears are usually eliminated.

4 Greater Tensile Strength Means Less Core Scrap:
Cores may be made extremely hard and strong, reducing the need for wires, without losing excellent knockout and collapsibility properties.

5 Excellent Stability:
Plaskon resin core binders are supplied in both stable powder and liquid forms, giving the individual foundryman his preference.

To find out how Plaskon foundry resins can save you money, send today for complete technical information. Contact Frederic B. STEVENS, Inc., distributors, or write direct to Plaskon Division, Libbey·Owens·Ford Glass Company, Toledo 6, Ohio.

Distributed by

FREDERIC B. STEVENS INCORPORATED
EVERYTHING FOR A FOUNDRY
DETROIT 16, MICHIGAN

PLASKON DIVISION
Libbey • Owens • Ford Glass Company
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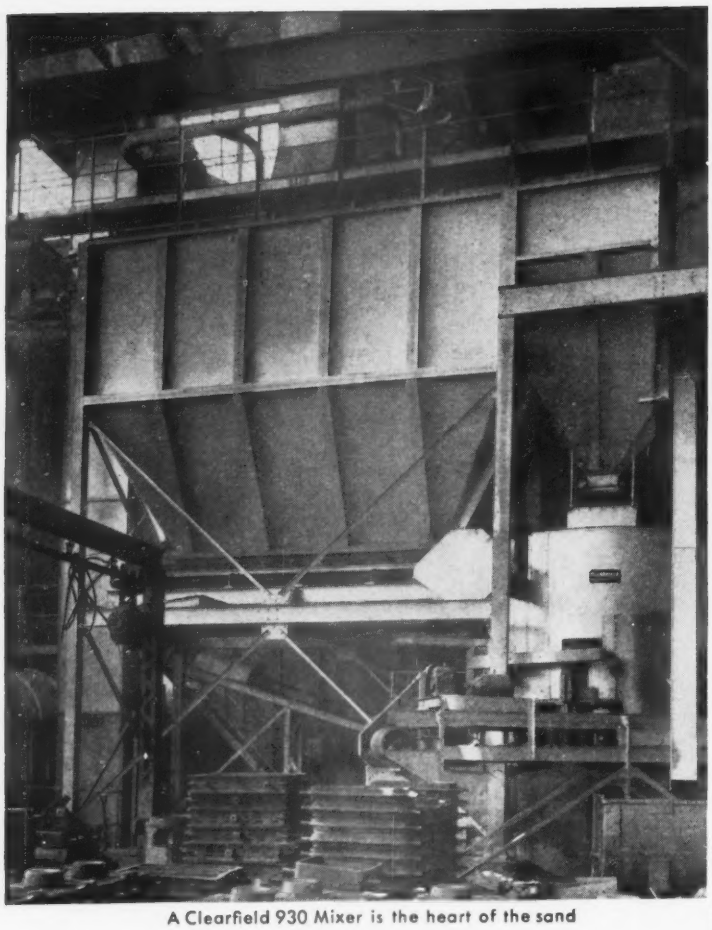
Manufacturers of Molding Compounds, Glues, Industrial and Coating Resins

In Canada
Canadian Industries, Ltd.
Montreal, P. Q.

INSIST ON
PLASKON®
FOUNDRY RESINS
FOR BETTER SAND CORE BINDERS

LOF GLASS PLASKON FIBER-GLASS



A Clearfield 930 Mixer is the heart of the sand conditioning system in a gray iron foundry.

wherever foundry sand is used . . . .

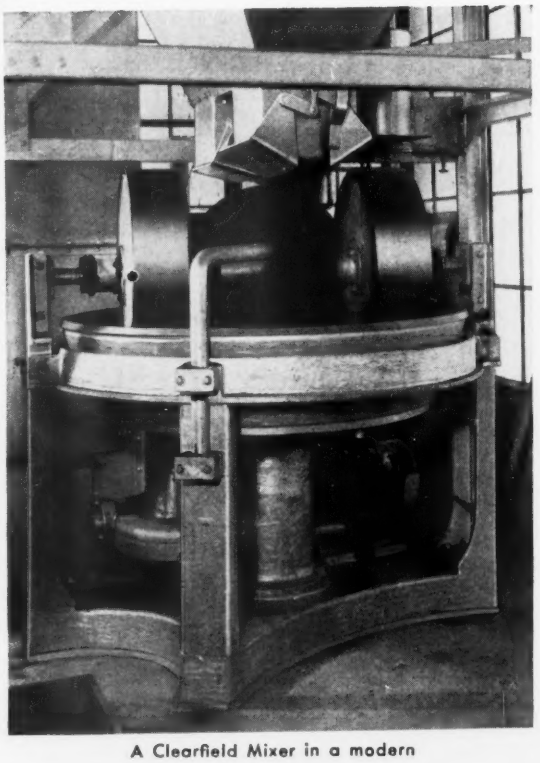
the

Clearfield Mixer *is needed*

A consistent and adequate supply of good foundry sand is indispensable to the efficient production of high quality castings—and that's the kind of sand supply the Clearfield Mixer turns out all the time. With a Clearfield you can assure yourself of the amount of sand you need, when you need it, where you need it and with the qualities you require.

Clearfield Mixers are available in a range of sizes to meet any requirement. As individual units or as part of an integrated sand processing system, Clearfield Mixers provide dependable, efficient and economical performance.

Write today for Catalog No. 83 for information.



A Clearfield Mixer in a modern brass foundry.

CLEARFIELD
MIXER

MIXES, TEMPERS
AERATES

CLEARFIELD
MACHINE COMPANY

CLEARFIELD
PENNSYLVANIA, U. S. A

As castings tumble, so do costs

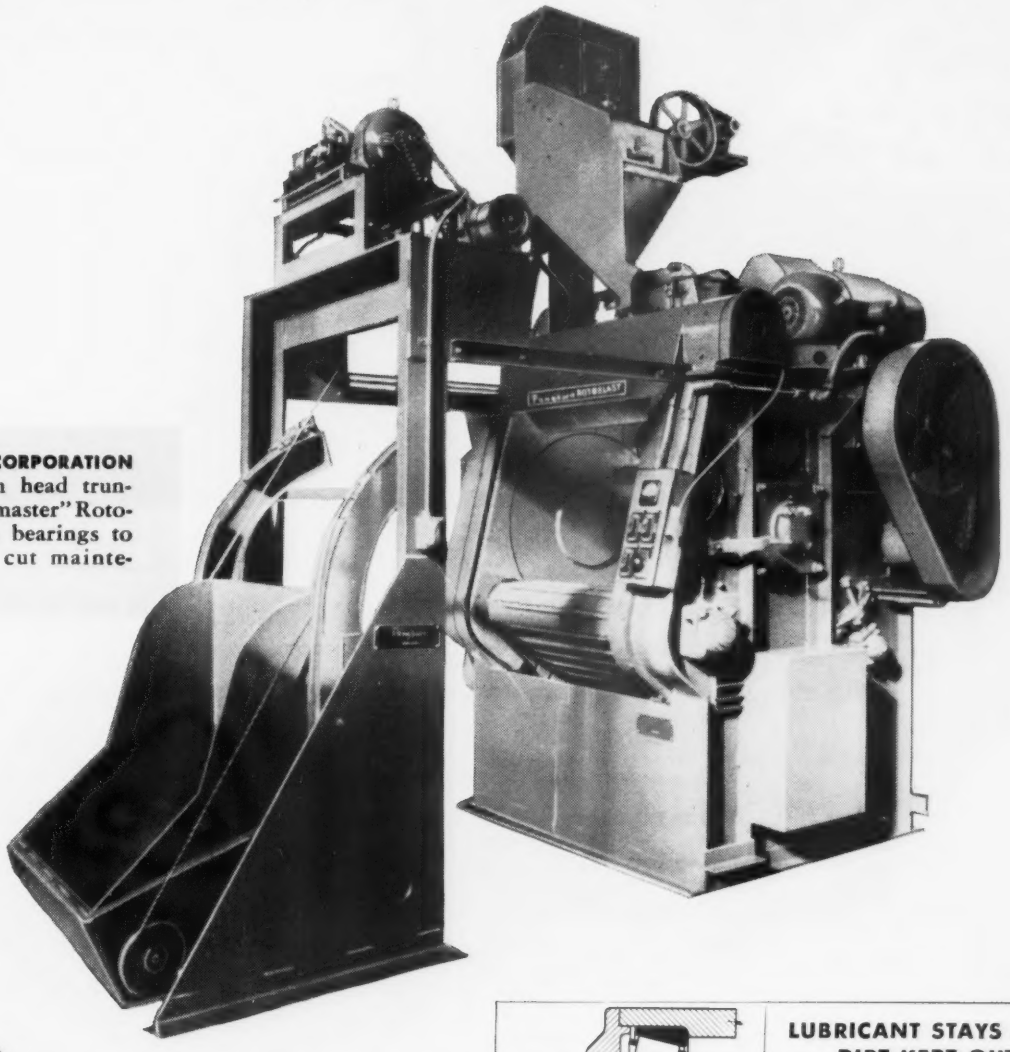
...with barrel on TIMKEN® bearings

WHEN the "Blastmaster" tumbles castings and forgings in a high velocity stream of abrasive, it's essential that the flying abrasive be sealed in the barrel. The Pangborn Corporation solves this problem by mounting the drum head trunnions on Timken® bearings. Their tapered construction takes all radial and thrust loads, holds drum ends and work conveyor in rigid alignment. Result: a running seal tight enough to protect operating parts of the machine from tiny particles of flying abrasive in the barrel.

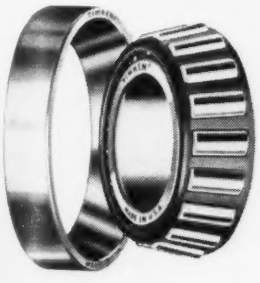
Full line contact gives Timken bearings extra load-carrying capacity to handle pay loads of as much as 1800 lbs. Case-hardened rollers and races with shock-resistant cores take the repeated slamming down of heavy forgings on the bottom of the barrel.

Made of special high quality alloy steel, Timken bearings normally last the life of the "Blastmaster" in which they're used. Be sure to specify them in the machines you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



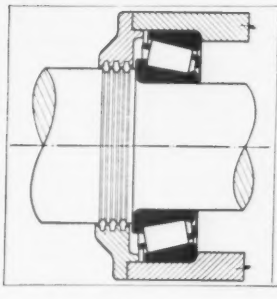
The **PANGBORN CORPORATION** mounts the drum head trunnions of its "Blastmaster" Rotoblast on Timken bearings to minimize wear, cut maintenance costs.



TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS

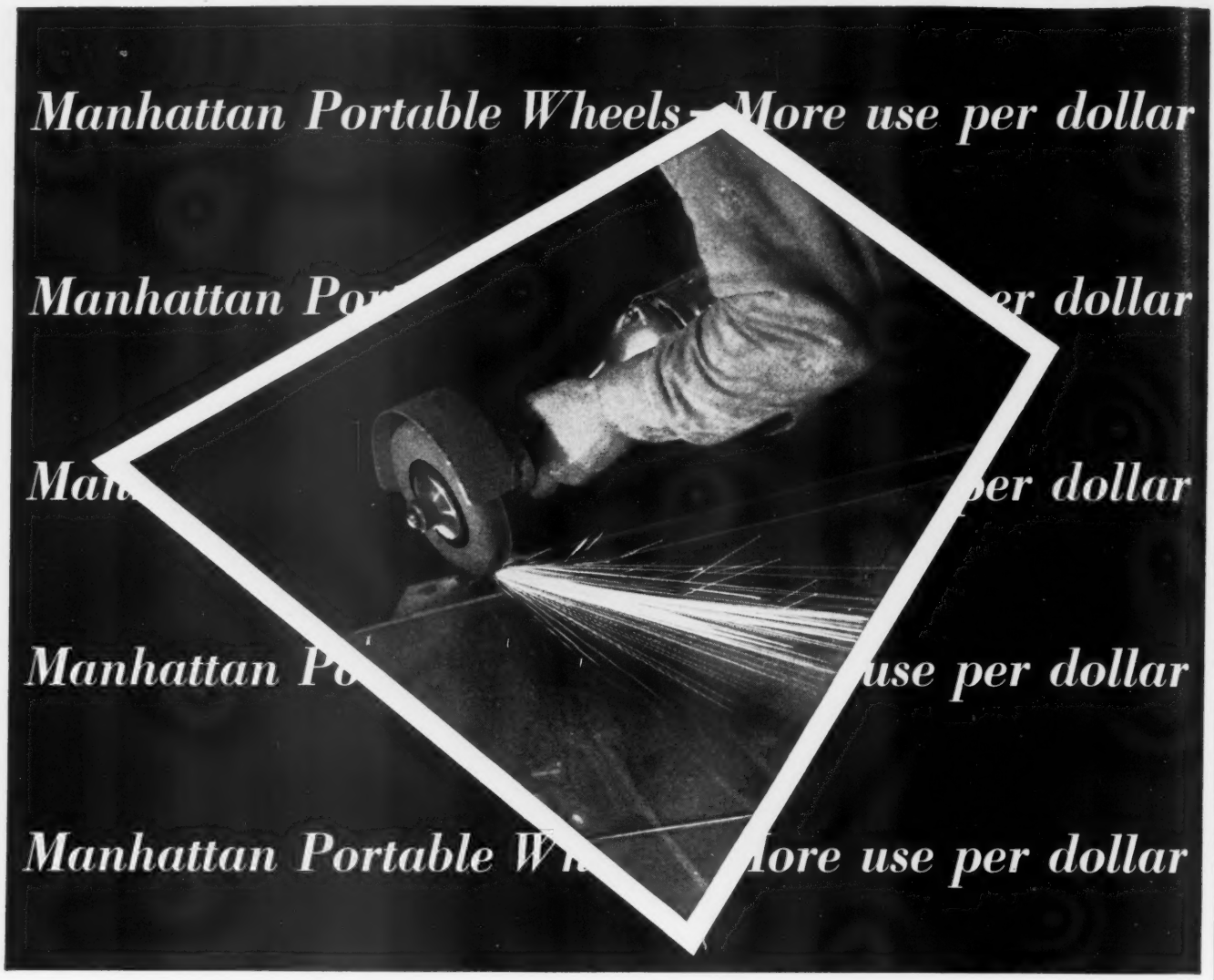


LUBRICANT STAYS IN —DIRT KEPT OUT

Because Timken bearings hold shafts concentric with housings, closures are made more effective. Lubricant is retained, dirt and moisture kept out.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER — BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION


Manhattan Portable Wheels—More use per dollar
Manhattan Portable Wheels—More use per dollar
Manhattan Portable Wheels—More use per dollar
Manhattan Portable Wheels—More use per dollar
Manhattan Portable Wheels—More use per dollar

DESIGNED BY YOU . . . Manhattan Portable Wheels are built to solve the specific problems encountered in your plant . . . to remove *more* metal . . . *faster* . . . at *lower* cost. Yes, the type of abrasive, grain size, hardness, structure and bond of the Manhattan Portable Wheel you buy are determined by the specific requirements of your work . . . by a careful analysis of *your* needs . . . This is typical of Manhattan service . . . of Manhattan Abrasive Wheels . . . built with the job in mind. The result—uniform quality, longer life, and more output per man-hour. You get MORE USE PER DOLLAR when you specify "Manhattan".

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO ABRASIVE WHEEL DEPARTMENT

R/M

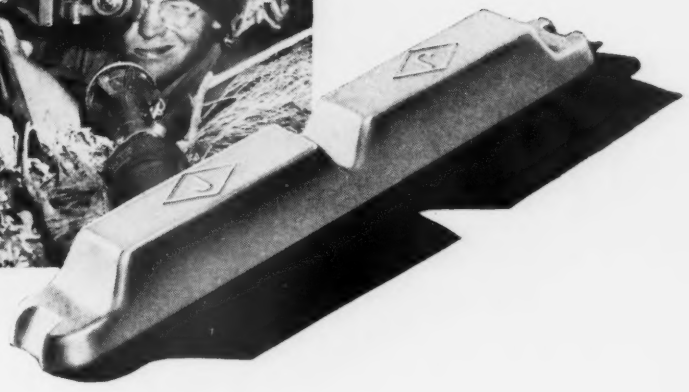
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Teflon Products • Packings • Sintered Metal Parts • Bowling Balls

U. S. Army Photograph

SPECIFICATIONS
MIL-A-10935-6-7



96 FOOT POUNDS IMPACT WITH NO FRACTURE

ALMAG 35

ALUMINUM ALLOY

withstands Extreme Test on 3/16" Wall Section

In order to pass the "Guillotine" test, bazooka barrels permanent-mold cast of Almag 35, supported on wedges, must withstand the impact without fracture of an 8 lb. steel ball dropped 12 feet.

Such performance is proof that Almag 35 excels all known Aluminum casting alloys for impact resistance strength.

A series of tests on *machined sections* of these production barrels showed Tensile Strength from 35,250 to 39,138 psi.; Yield Strength 19,488 to 20,373 psi.; and Elongation 12–15%.

Before you specify ANY alloy, ask for ALMAG recommendations.

COVERED BY U.S. PATENTS
NOS. 2564044 and 2583473

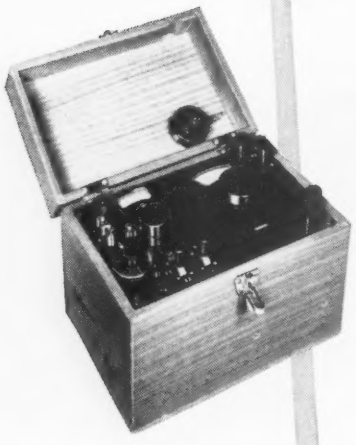
WILLIAM F. JOBBINS INCORPORATED

AURORA P. O. BOX 230 ILLINOIS

FOR

"on-the-spot" checking...

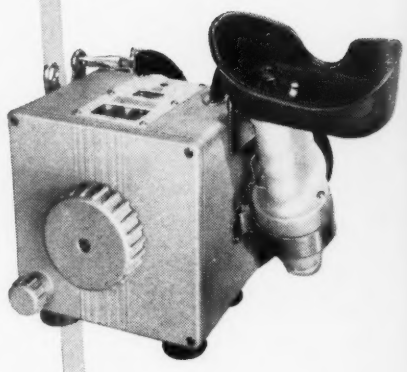
INVESTIGATE THESE WIDELY-USED TEST SETS



In appearance, the 8657-C Indicator is typical of L&N portable test sets and is outstanding for fully dependable, moderate precision. The portable series also includes instruments for measuring temperature, electrolytic conductivity, electrical resistance and pH.

High on any list of "musts" for making spot-checks of production processes and equipment are these L&N Test Sets. For these versatile instruments combine the portability, ruggedness and simplicity of design needed for plant use, with the accuracy and flexibility necessary for use in the laboratory.

Specifications for just a few of these instruments that are particularly useful to the Metal Industry appear below. For more complete information, contact our nearest office or write 4917 Stenton Ave., Phila., Penna.



The 8623 Optical Pyrometer —Direct Reading in degrees, this compact instrument enables users to measure the temperature of molten metals accurately and quickly.

FOR THERMOCOUPLE EMF MEASUREMENT

Instrument	List No.	Range	Limit of Error
Double-Range Portable Millivolt Indicator. For plant use. For thermocouple voltage measurements — reads in millivolts; manual reference junction compensation.	8657-C	Ranges: 0 to 16 mv and 16 to 64 mv. Reference Junction Compensator Ranges: 0 to 1 mv and 0 to 5 mv.	Low Range: ±0.05 mv. High Range: ±0.15 mv.

Double-Range Portable Millivolt Indicator. For Laboratory use. A more precise instrument for uses similar to 8657-C.	8662	Ranges: 15 x 1 mv ÷1.1 mv slidewire 15 x 5 mv ÷5.5 mv slidewire Reference Junction Compensator Ranges 0 to 1 and 0 to 5 mv.	Low Range: ±0.01 mv. High Range: ±0.05 mv.

FOR pH AND REDOX MEASUREMENT

Stabilized pH Indicator — for direct reading in pH; also for redox measurements. May be used in grounded or ungrounded solutions. For 115 volts, 60 or 50 cycles supply. Portable, Battery operated Model is No. 7662.	7664	0 to 14 pH; 0.1 pH divisions 0 to ± 700 mv; d-c; 5 mv divisions 0 to ±1400 mv; d-c; 10 mv divisions	1 scale division

FOR TEMPERATURE MEASUREMENT

Instrument	Type	List No.	Range	Scales
Optical Pyrometer For checking temperatures of molten iron, steel, etc.	Direct-Reading for Molten Metal Temperatures (Non Black-Body conditions — emissivity of 0.4)	8623	1400 to 3200 F	Two: 1400 to 2250 F 1950 to 3200 F
Optical Pyrometer For checking temperatures of flue linings, roof linings, etc.	Direct-Reading for Black-Body conditions.	8621	1400 to 3200 F	Two: 1400 to 2250 F 1950 to 3200 F

LEEDS NORTHRUP

instruments — *automatic controls • furnaces*

Journal Ad. No. E-0600(1b)

Workmen loading a Bullard oven with Truline-bonded cores weighing from 500 to 2500 pounds. Castings made with these cores are the basic components for the rugged, accurate, and dependable Bullard Cut Master vertical turret lathes.

TRULINE® BINDER HELPS BULLARD CUT COSTS AND BAKING TIME

Cores such as this, weighing 2000 pounds and more, are baked thoroughly overnight when bonded with Truline.

The economy and performance of Truline Binder in helping The Bullard Company's foundry at Bridgeport, Connecticut, to produce clean, sound castings tell the story.

Truline Binder reduces foundry costs in many ways. Cores collapse easily and shake out fast to give cleaner, smoother castings. That makes less cleaning and chipping—quicker movement of jobs off the floor.

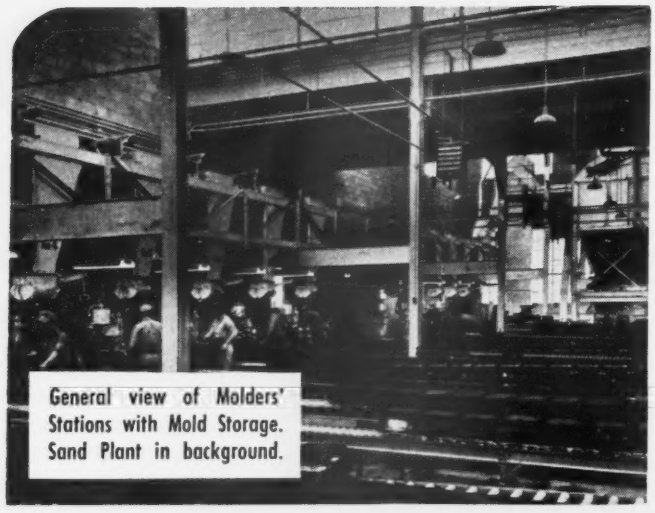
Let us demonstrate how Truline Binder can help you. Our foundry service men will be glad to supply details.

Naval Stores Department

HERCULES POWDER COMPANY

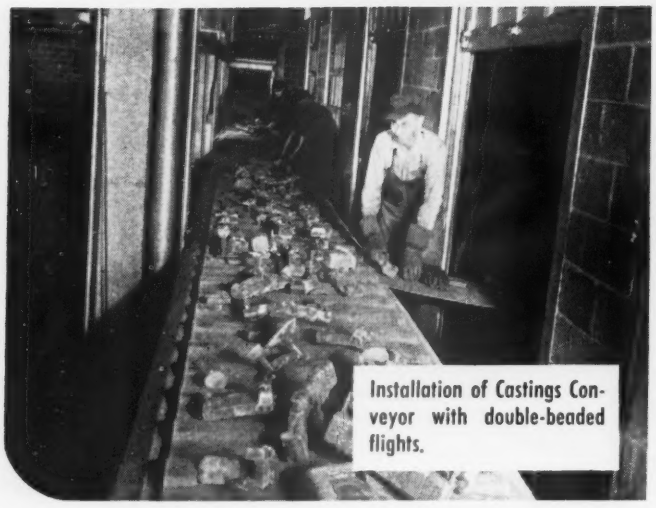
920 King St., Wilmington 99, Del.

NF53-3

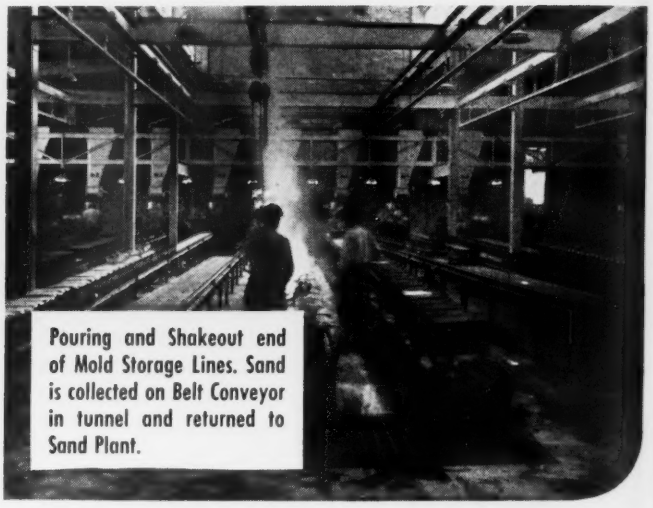


General view of Molders' Stations with Mold Storage. Sand Plant in background.

Modernization... steps up production and profits



Installation of Castings Conveyor with double-beaded flights.



Pouring and Shakeout end of Mold Storage Lines. Sand is collected on Belt Conveyor in tunnel and returned to Sand Plant.

When You Mechanize, Do it the Jeffrey Way!

Foundry mechanizations since the war have increased worker-production up to 20% according to government figures. Much of this improvement came through minimizing manual movement.

Jeffrey's engineers are constantly developing new ways to speed production and cut costs — and Jeffrey plants are producing the equipment.

Jeffrey's Modernization Service will help mechanize your sand handling, reclaiming, mixing, preparing and distributing systems; ventilating and dust-arresting equipment; mold, casting, flask, coke, pig iron, scrap and limestone-handling equipment; conveyors and reduction machinery.

Write for Catalog No. 845

FEMA

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

. . .IT'S A JOB FOR JEFFREY!

"We've used rings, ring segments and cements by CARBORUNDUM. We believe they're the...

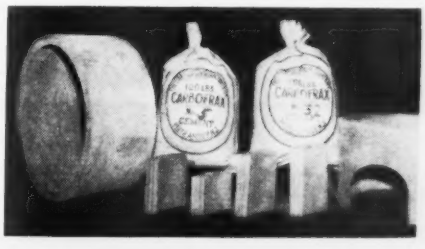
Best Linings Obtainable—Anywhere"

says Chicago non-ferrous foundry

The Christensen & Olsen Foundry Co., specializing in copper-base castings, has 10 crucible furnaces. Six are of the pit type and four are tilters. The pit type is lined with one-piece rings, and in the tilters they use segmental tile linings. Both are made of CARBOFRAX® silicon carbide refractories, and both are backed up with 2½" (or more) of insulating cement—our ALFRAX® castable aluminum oxide cement.

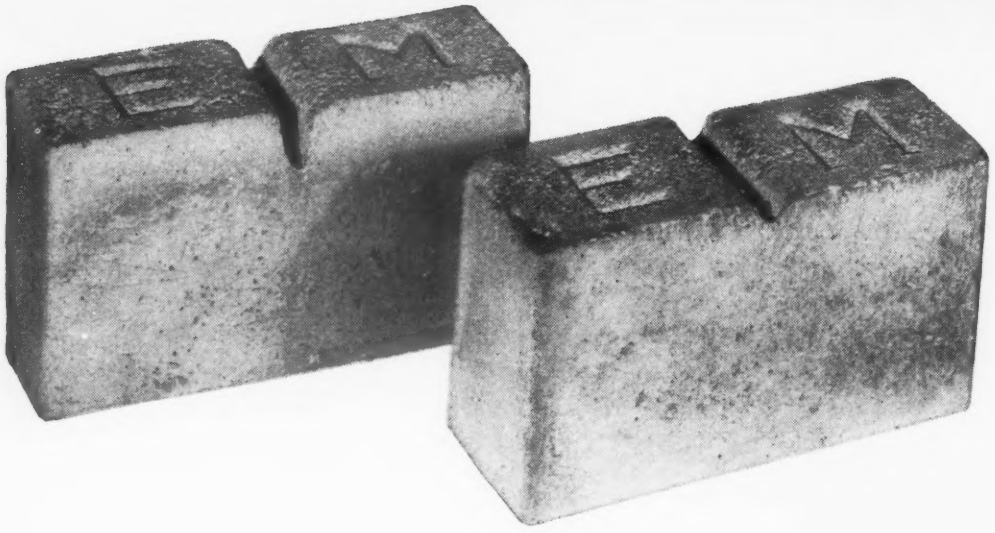
In either case, the linings are very easy to install. The rings can be set by hand, without a hoist, then the castable insulating cement is just mixed with water and poured. A complete lining takes only a couple of hours to put in, and is usually good for about two years. The silicon carbide and the aluminum oxide can take punishing temperature conditions that are simply not practical with most other refractories. Moreover, the ALFRAX cement's low heat capacity and low thermal conductivity keep fuel costs to a minimum. In short, they go in faster, stay in longer, and give faster, more uniform heating than other linings.

This foundry has been using linings by CARBORUNDUM for over 15 years. They state simply that they have yet to find better materials for non-ferrous furnaces. We'd like to interest you, too. We make lining materials to fit your every need—rings, ring segments and cements. For details address: Dept. A-63, Refractories Division, The Carborundum Co., Perth Amboy, New Jersey.



CARBORUNDUM

Registered Trade Mark



For lower cost and more convenient handling

USE ELECTROMET'S *PALLETIZED* SILICON BRIQUETS

A new briquet designed especially for shipment on pallets has been developed by ELECTROMET. The briquet is shaped like a brick so that it can be stacked on pallets for more convenient and economical handling. These pallet shipments, which are available at no extra charge over bulk shipments, can easily be unloaded and handled in your plant by lift truck or overhead crane. Handling costs are reduced and inventory-taking is simplified. The pallets are expendable and need not be returned.

"EM" palletized silicon briquets are about 6 in. x 3 in. x 2 in. in size, weigh 5 lb. gross, and contain exactly 2 lb. of silicon. The briquets are notched, so that they can easily be split in half when 1 lb. additions of silicon are desired. Because they contain an exact amount of silicon, these briquets offer close control of analysis in cupola melting operations.

Silicon is a deoxidizer, cleanser, and softener of gray iron. Silicon briquets offer a practical, convenient, and economical means of adding this alloy. Ask to have one of our metallurgists call and explain more fully the advantages and use of "EM" silicon briquets.

The terms "Electromet" and "EM" are registered trade-marks of Union Carbide and Carbon Corporation.

Pallets holding approximately 4,000 lb. of "EM" silicon briquets can easily be handled by lift truck.

This lifting device is used to handle pallets with an overhead crane. An ordinary sling can also be used.

ELECTRO METALLURGICAL COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
OFFICES: Birmingham • Chicago • Cleveland • Detroit
Houston • Los Angeles • New York • Pittsburgh • San Francisco
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
TRADE MARK
Ferro-Alloys and Metals

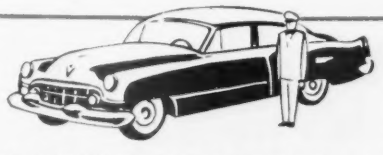
"You must like those better BUFFALO PATTERNS"

Out of town pattern buyers are becoming familiar faces in Buffalo. Here they have discovered a profitable wedding of the *new* and the *old* that is fast becoming the talk of the foundry world.

The *new* part of this discovery is a *more complete* Engineering service that minutely plans *every* detail of *every* job. Coupled with this more thorough planning is the old fashioned type of fine Craftsmanship that is never satisfied with anything short of perfection. This is a combination you can't beat and it pays off for the foundry, too! Buffalo Patterns *never* require any adapting or extra rigging! They fit your plant and production schedules like a pair of "old shoes". . . And once in production, you'll find that Buffalo equipment will introduce you to the lowest scrap ratio you've ever experienced.

BE OUR GUEST

Just let us know when you are coming to Buffalo on pattern business. One of our cars will meet you at your plane or train and transport you to our club where you will be our guest during your stay.



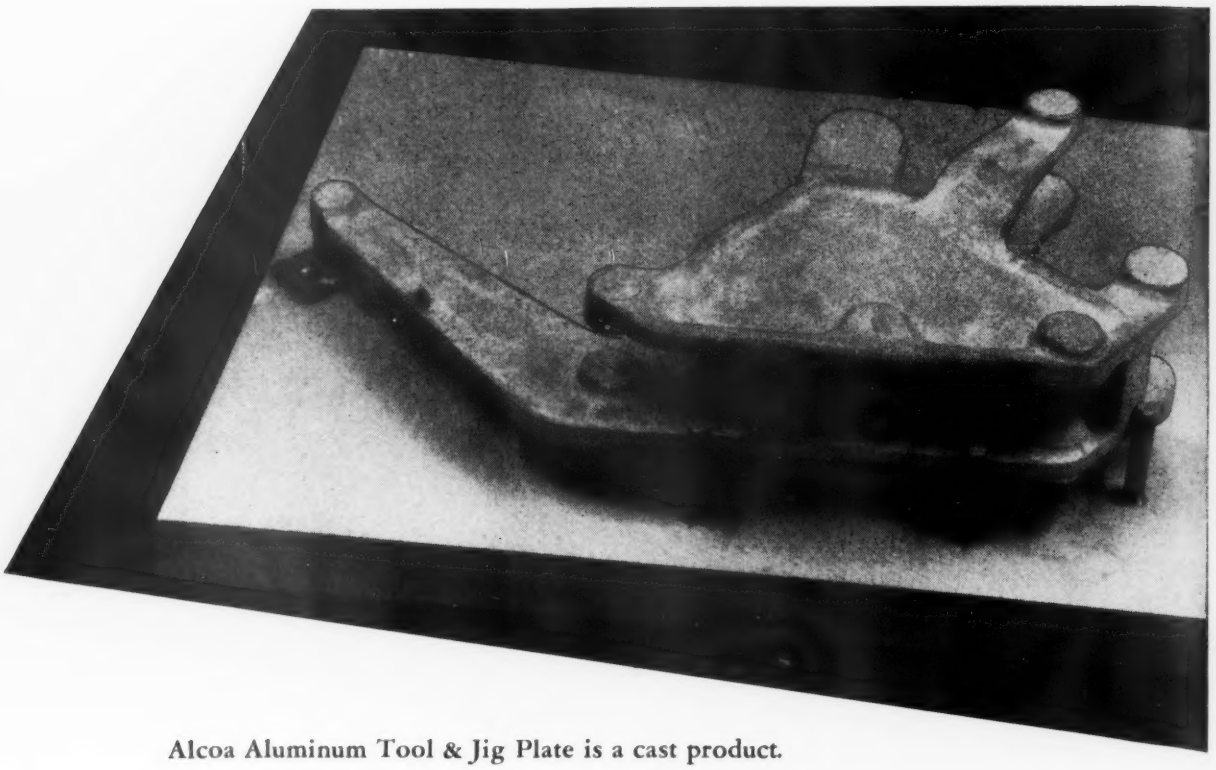
Production and Experimental Pattern Equipment • Plastic and Wood Models, Precision Parts, Jigs and Templates • Shell Mold Pattern Equipment • Permanent Molds for Foundries, Injection Plastics and Reinforced Plastics • Engineering Drawings • Forging Dies • Non-Ferrous Castings • Shell Mold Castings • Metallizing

BUFFALO PATTERN WORKS, INC. • **832 HERTEL AVE., BUFFALO 16, N. Y.**

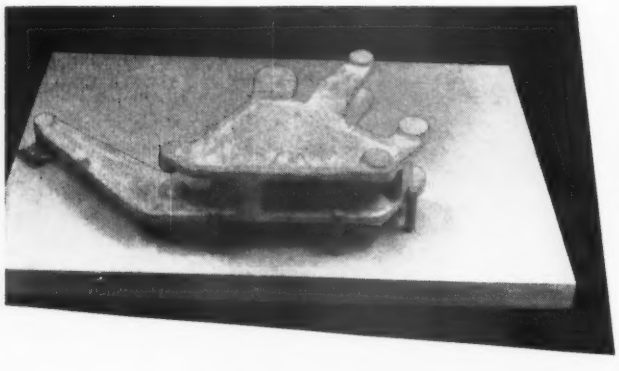
DESIGNERS AND MANUFACTURERS OF PATTERN EQUIPMENT FOR OVER HALF A CENTURY

This checking fixture weighs less

because it's made of Alcoa Aluminum Tool & Jig Plate. Many manufacturers are turning to lightweight Alcoa Plate—fully normalized, machined both sides and costing less than ½ the price of other types.

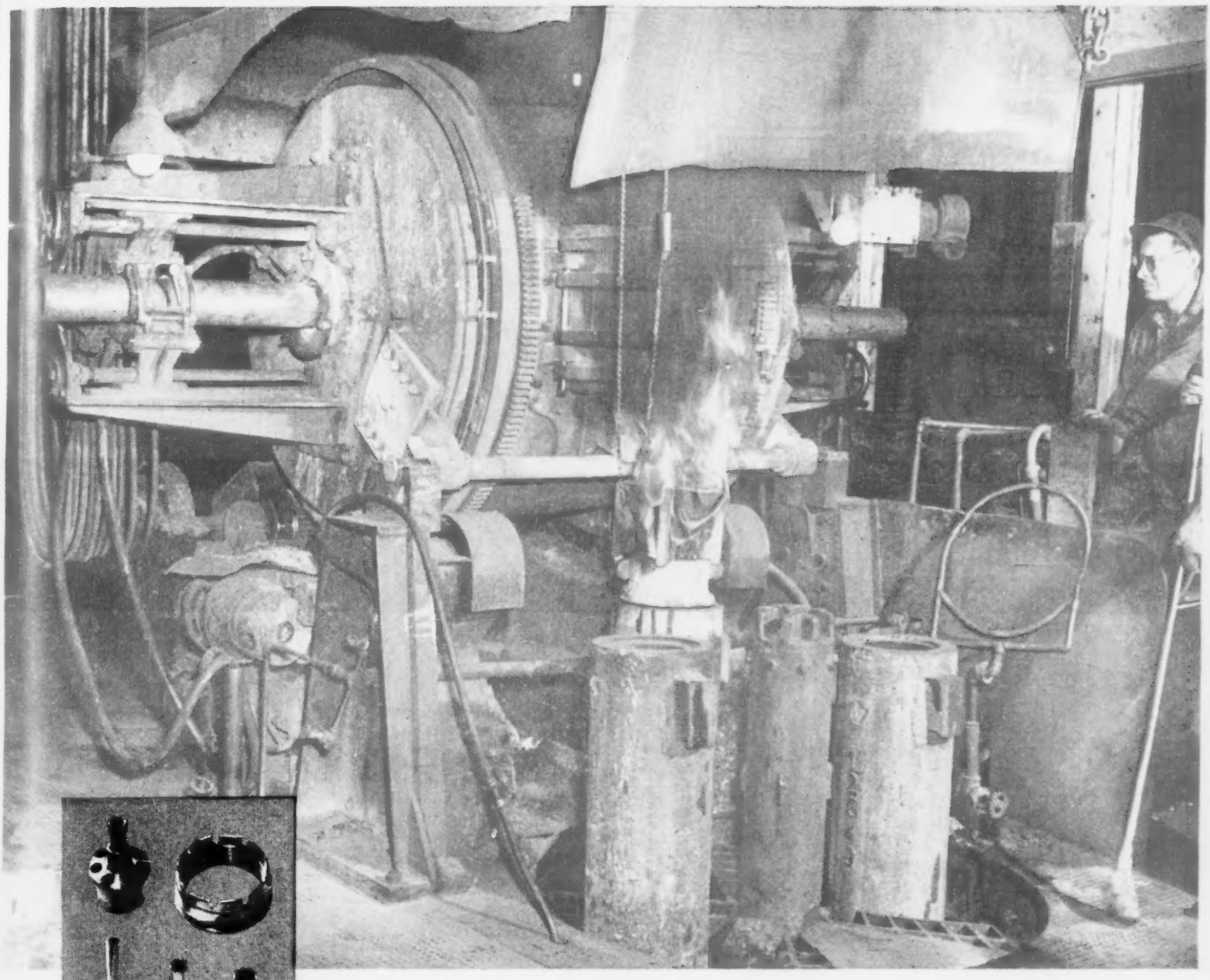


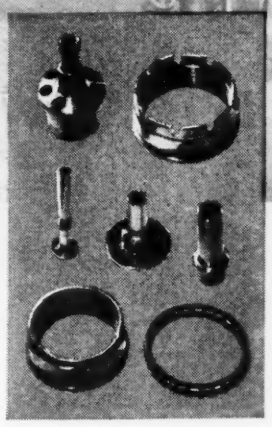
Alcoa Aluminum Tool & Jig Plate is a cast product. It is available from stock in thicknesses of ⅜″ to 4″—in any dimensions up to 48″ x 96″. Tolerances of ±.010″ are held on thicknesses. For full information on Alcoa Tool & Jig Plate, contact your local Alcoa sales office . . . or write Aluminum Company of America, 1949-F Alcoa Building, Pittsburgh 19, Pa.



Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA





Some of Mueller Brass Company's products made from DEF-melted alloys.

11 tons of copper alloy billets from this furnace every 24 hours

In this nose-tilting, 1000-lb. capacity Detroit Rocking Electric Furnace at Mueller Brass Company, alloys are changed from heat to heat. Yet it melts and pours about 11 tons of billets every 24 hours.

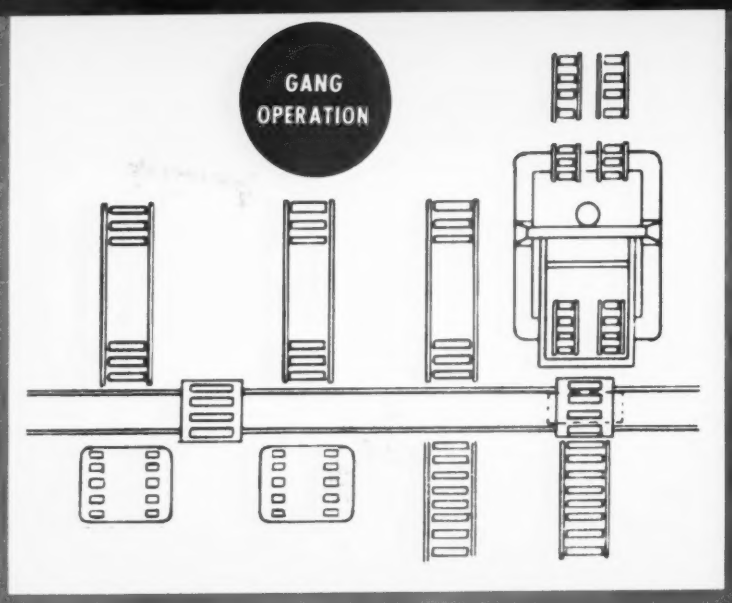
It's a good example of the versatility and fast-melting characteristics of Detroit Rocking Electric Furnaces. Each heat produces a billet of precisely controlled analysis. Rocking action of the furnace makes most efficient use of the heat from the indirect arc, guarantees homogeneity of metal. High quality metal means fewer rejects, better products.

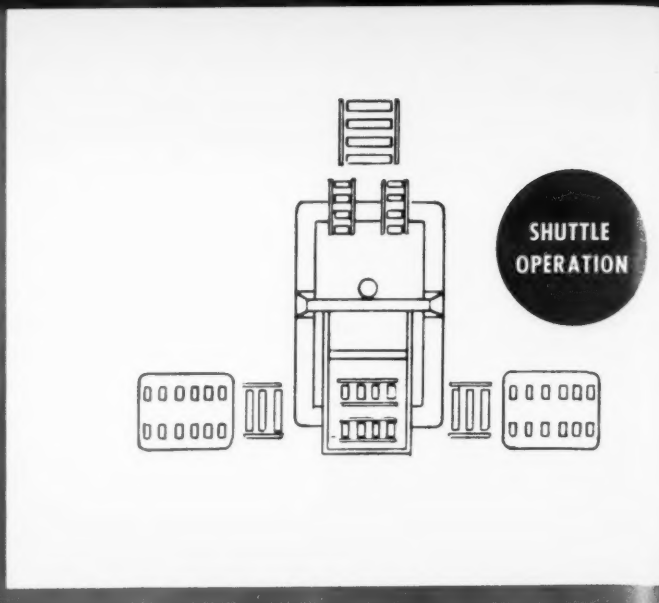
Detroit Electric Furnaces, in capacities from 10 to 8000 lbs., are outstanding producers for both ferrous and non-ferrous metals. Outline your requirements and we'll give you complete information to bring new efficiency to your metal melting. Write today!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sau Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

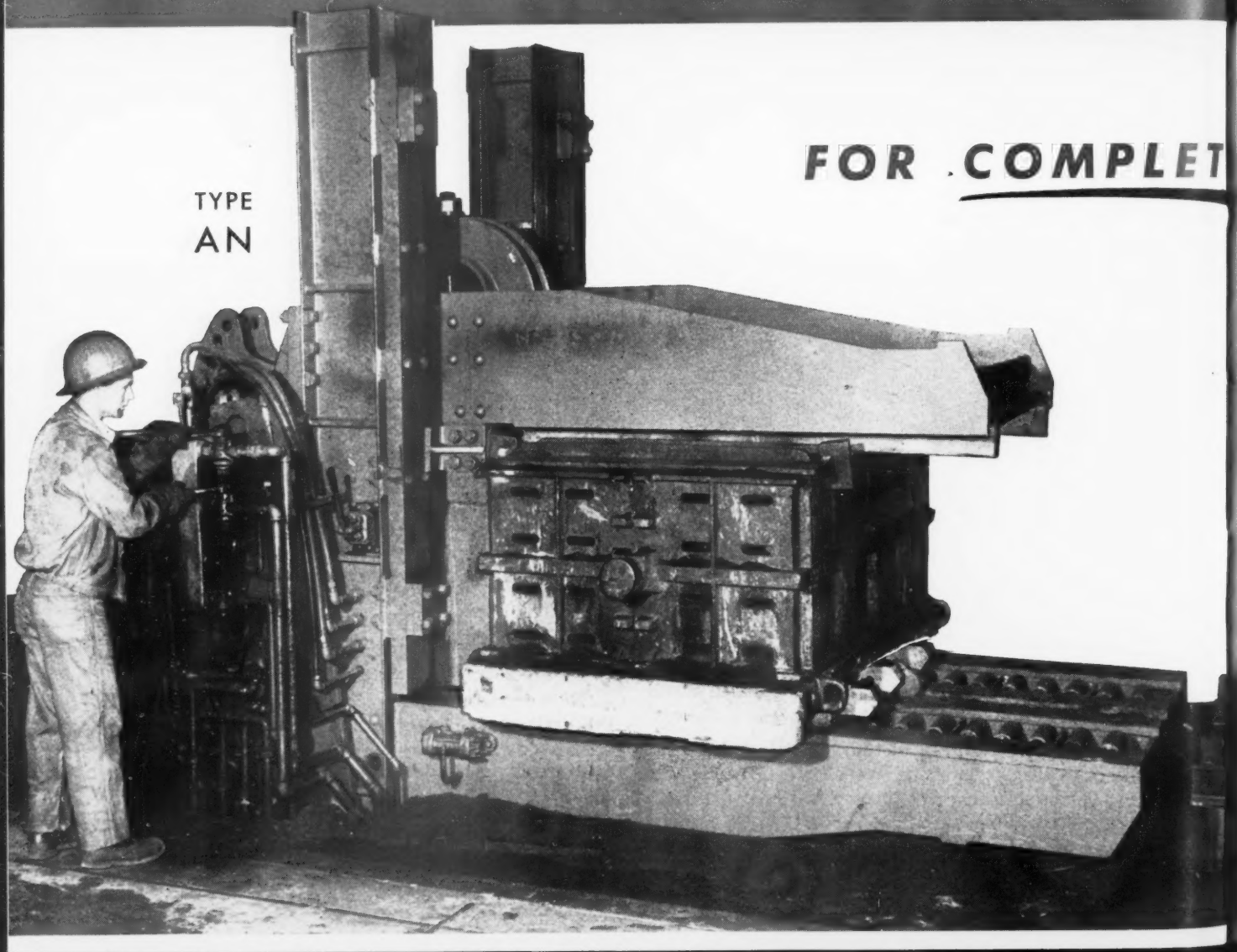




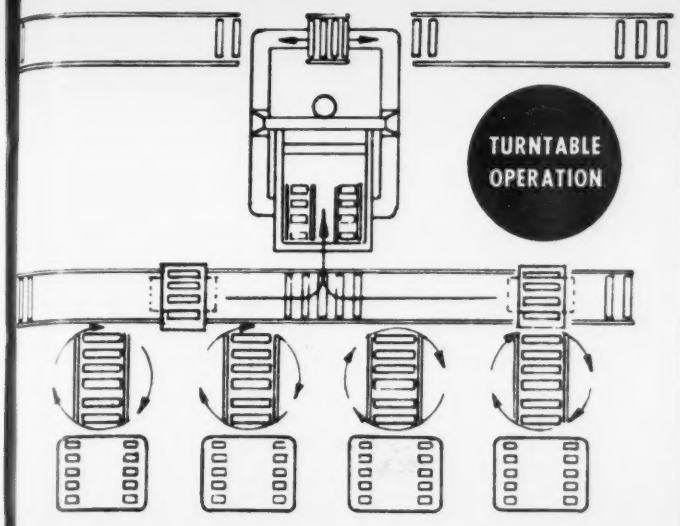
UNLIMITED ROLL

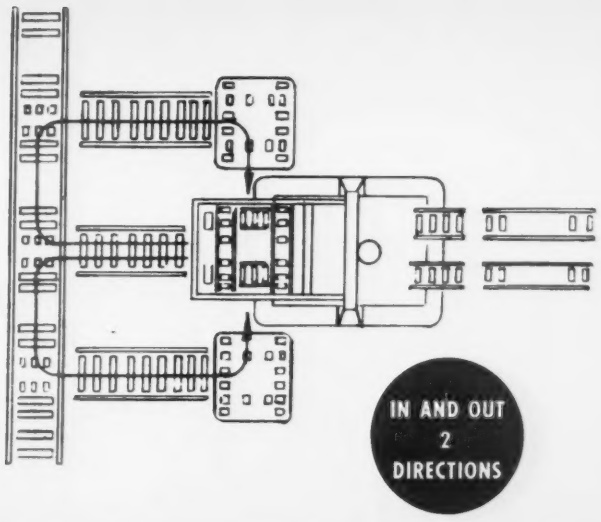
FOR COMPLET

TYPE
AN



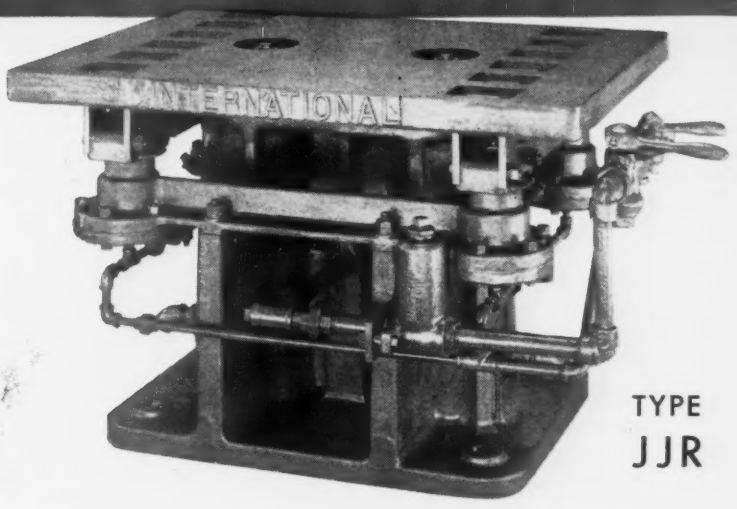
INTERNATIONAL MO





COMBINATIONS

Versatility
Flexibility
Adaptability



TYPE
JJR

. . . IN ANY SHOP . . . FOR ANY NEED!

The roller layouts shown above are just a few of the many roller combinations possible with the International Line of AN and JJR Machines.

"There is an INTERNATIONAL for Every Type of Job"

The International Line is designed, built, and sold by experienced Foundry Engineers who have a practical working knowledge of the problems of the industry.

ING MACHINE COMPANY

LA GRANGE PARK, ILLINOIS

Furnace linings last longer

when they are made of Norton-engineered Special Refractories

Fewer shut-downs and more continuous operation is always the story when linings are made of Special Refractories engineered to your job by Norton. Whether you are melting ferrous or nonferrous metals there are Norton mixtures for a wide variety of successful applications that mean more metal melted per lining, fewer furnace shut-downs and generally lower costs.

There are so many complications in metal melting, involving chemical, electrical and physical conditions it will pay you to take advantage of Norton's 40 years' experience in solving Special Refractory problems like yours.

Many different materials

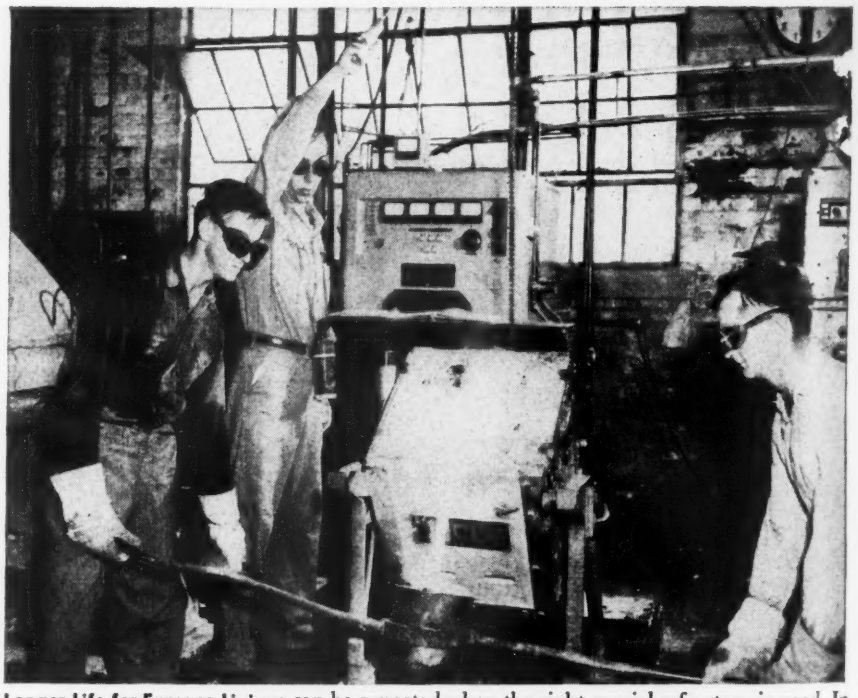
Norton furnishes Special Refractory grain, cements and bonded shapes in a wide variety of mixtures each engineered for a particular set of conditions.

Such special Refractory Materials as CRYSTOLON* (silicon carbide), ALUNDUM*, FUSED STABILIZED ZIRCONIA.

What is your problem?

We believe you will benefit by consulting your nearby NORTON Representative or writing Norton Company, 305 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Ontario.

Taking the Temperature reading on the melt at the Metalmold Corporation plant at Groton, Mass. Temperatures go 3200° F. and higher. MAGNORITE* grain placed between the crucible and the coil has such high rammed density that it offers great resistance to penetration, erosion and chemical attack.



Longer Life for Furnace Linings can be expected when the right special refractory is used. In this plant they count on MAGNORITE to prevent short circuits in the event of crucible breakage. MAGNORITE keeps metal from reaching the primary coil of the furnace.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON

Special REFRACTORIES

Making better products to make other products better

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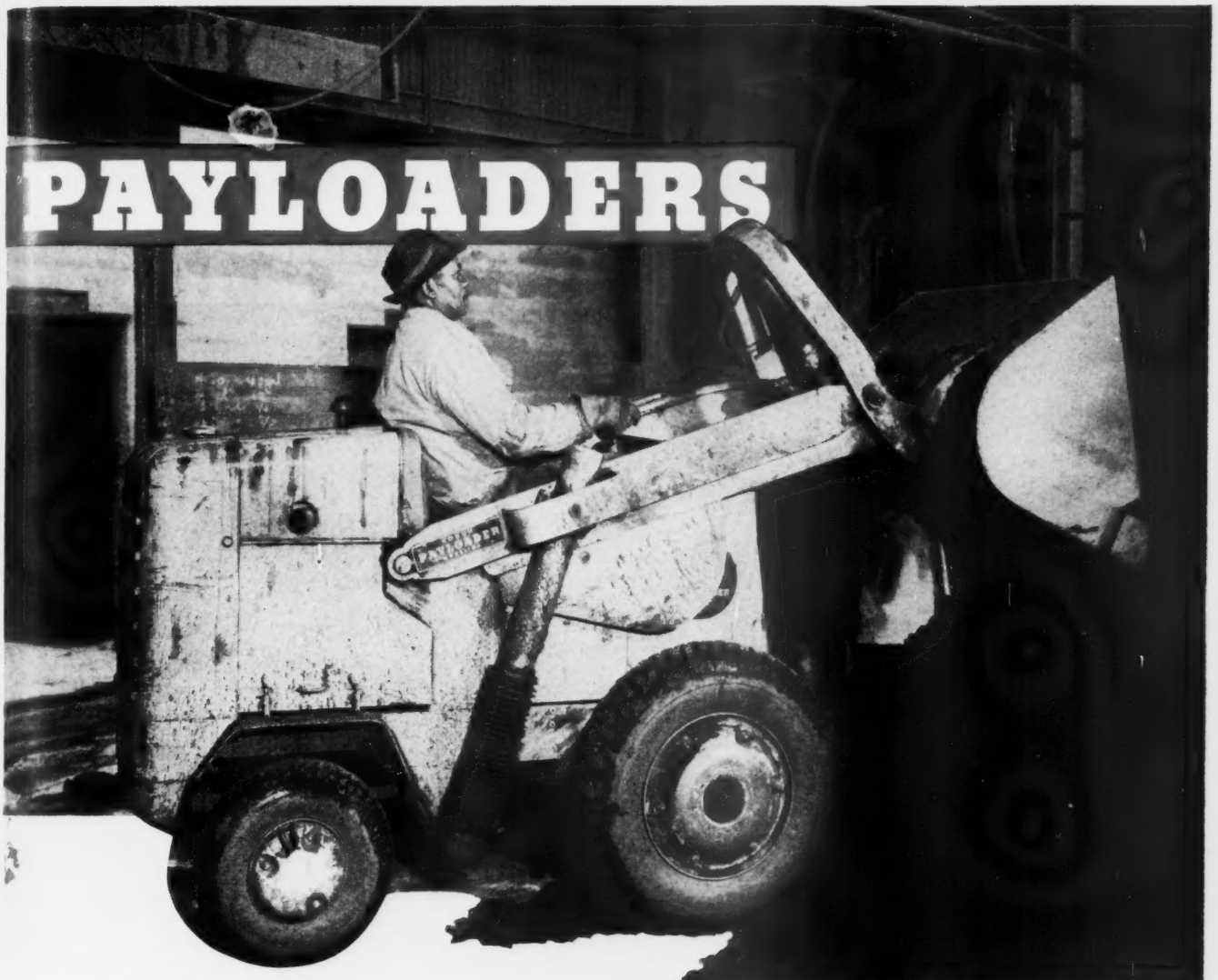


FOR HIGH-SPEED, LOW-COST SAND HANDLING

You get your sand-handling operations into high gear when you put a "PAY-LOADER" on the job. And these versatile high-speed tractor-shovels put the skids under sand-handling *costs* too. They're doing a real job in foundries all over the land. They unload sand from box cars . . . carry it to storage . . . carry it to mullers . . . deliver it to molding stations and core makers . . . scoop it up from the pouring floors and clean-out rooms . . . return sand for reclaiming . . . windrow it for the cutter.

"PAYLOADERS" do other jobs too — such as handling small castings, slag, coke, coal, ashes, waste and snow. It will pay you to get the facts on the "PAYLOADER" way to faster, cheaper handling costs. Your "PAYLOADER" Distributor is ready to give them to you. Call him today or write The Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Ill.

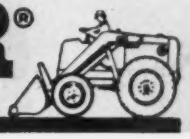
FREE HANDBOOK

Tells how and where to look for signs of inefficient bulk-materials handling . . . how to analyze, organize and set up an efficient handling system. Plus many useful tables and data. Write for "Bulk Materials Handbook."

SAY "HUFF"

PAYLOADER®

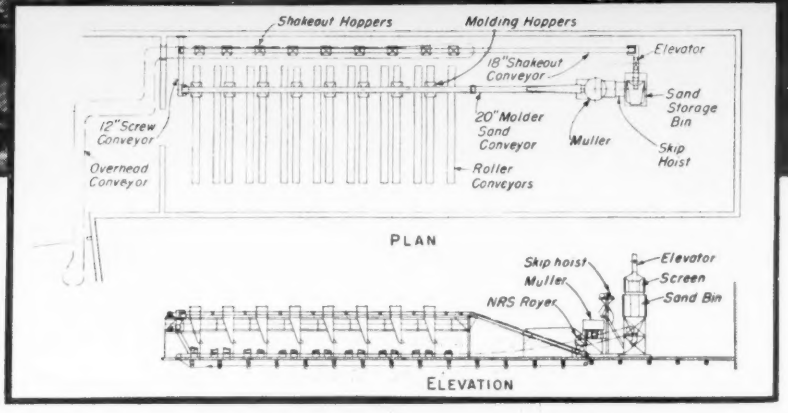
THE FRANK G. HOUGH CO. • Since 1920



G-W engineered materials handling

8 WAYS BETTER

FOR CHASE BRASS & COPPER CO., INCORPORATED



In the foundry operation of Waterbury Manufacturing Co. – a division of Chase Brass & Copper Co., Incorporated – Gifford-Wood has engineered eight major improvements in the handling of molding sand, molds, and castings into the new materials handling system. These improvements, brought about by the G-W system include –

1. **Consolidation of two foundry rooms into one.**
2. **Higher production through more efficient space use.**
3. **One casting method replaces two formerly used.**
4. **Virtually all manual handling has been eliminated.**
5. **Casting quality has been increased.**
6. **Working conditions are considerably better.**
7. **Maintenance costs have been reduced.**
8. **Over-all production time has been cut sharply.**

This is but one of the more recent materials handling problems solved by Gifford-Wood. For more than 140 years, G-W has designed, built, and installed similar complete systems for nearly every industry in the book. This experience is at your disposal.

A 20"-wide overhead conveyor moves molding sand past molding hoppers where operators remove it as needed by a lever-operated diverting plate. A 12" screw conveyor transfers unused sand laterally to an 18" shakeout conveyor at which point used sand collected from the molders in shakeout hoppers is added. A bucket elevator then dumps it into a storage bin from which it is skip-hoisted to a muller for mixing with new sand. After aeration and cooling it is deposited on the original belt for re-use. Roller conveyors handle molds at molding stations, and castings move to finishing on overhead monorail conveyors.

For details on this and many other G-W installations, ask for Materials Handling Catalog.

When You Think of Materials Handling – Think of

GIFFORD-WOOD CO.

Since 1814 • Hudson, New York

NEW YORK 17, N.Y. 420 LEXINGTON AVE.
ST. LOUIS 1, MO. RAILWAY EXCHANGE BLDG.
CHICAGO 6, ILL. 565 W. WASHINGTON ST.

8025

ECLIPSE FUEL
ENGINEERING WRITES:

"Heat Prover Completed a 30 Hour Burner Test In Just 6 Hours!"

Amazing Cities Service Heat Prover Works 5 Times As Fast As Old Method... More Accurate, Too!

Robert W. Pixler, Laboratory Supervisor for Eclipse Fuel Engineering Company, Rockford, Illinois writes:

"It did not seem possible that an instrument that is so fast and direct-reading could possibly have the accuracy we demand. But, we found the Heat Prover equally exact, possibly even more exact, than standard commercial testing equipment.

"Our test work with previous instruments was a long, drawn-out affair. But with the Heat Prover, we completed what would normally have been a 30-hour test in just 6 hours!...and we doubt that our old equipment could have maintained the accuracy delivered by Cities Service Heat Prover."

WHEREVER A FURNACE OPERATION IS INVOLVED, the Heat Prover can help increase productivity by providing:

- **Rapid, continuous sampling**
- **Simultaneous reading of oxygen and combustibles**
- **Direct measurement of oxygen and combustibles**
- **Easy portability**
- **No maintenance; no re-calibration**

For details, contact nearest Cities Service office or write Cities Service Oil Company, Dept. F23, Sixty Wall Tower, New York City 5, N.Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

A PRODUCT OF FOUNDRY SKILL AND *Borden's* SHELL-MOLD RESIN

Casting by AMERICAN VALVE MFG. CO., Coxsackie, N.Y.

Again...shell casting replaces forgings

American Valve used to buy these bonnets as forgings. But the cost was high. A large inventory and investment were required. And the finish of the forgings didn't match other cast parts of the valve.

Now American casts these bonnets in shell molds made with a Borden resin. Dimensions are accurate. The castings are sound, easily machined and lower in cost. New castings can be obtained within a matter of hours if necessary, so there's no need for a large inventory. Money formerly tied up in slow-moving parts is available for other uses.

Here's another example of the way that properly engineered shell-molding can cut costs, provide better finished products, and bring greater flexibility of operation. Borden foundry engineers will be glad to help you adapt the process to your needs. Address: The Borden Company, Chemical Division, Dept. F63, 350 Madison Avenue, New York 17, New York. F.3.5

FOUNDRY PRODUCTS DEPARTMENT

THE BORDEN COMPANY

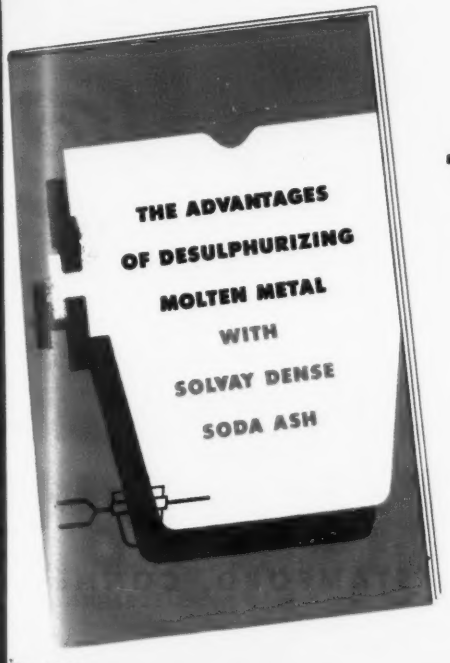
Chemical Division

Desulphurization with SOLVAY DENSE SODA ASH

✔ Offers Many Advantages

✔ Costs Less

SOLVAY DENSE SODA ASH is especially effective for desulphurization. This 100% active material helps produce better, more fluid metal . . . and gives you these other advantages: it's free-flowing; the small grains melt very rapidly, allowing faster, more uniform dispersion; and it's easily added by means of simple equipment. The use of Solvay Dense Soda Ash is a flexible one—you use only as much as you need. And remember, Solvay Dense Soda Ash is the *low cost* form of desulphurization!



Further Information Contained in Valuable Book—Available on Request

"The Advantages of Desulphurizing Molten Metal with Solvay Dense Soda Ash" has been published by Solvay for the benefit of the foundryman. It contains important information on the advantages you can gain by desulphurizing with Solvay Dense Soda Ash. It also explains what type of equipment is needed and how to obtain it. This book is available free—on request—by simply writing to Dept. F-6. Be sure to get your copy.

SOLVAY

SOLVAY PROCESS DIVISION

ALLIED CHEMICAL & DYE CORPORATION

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Soda Ash · Caustic Soda · Chlorine · Potassium Carbonate · Calcium Chloride
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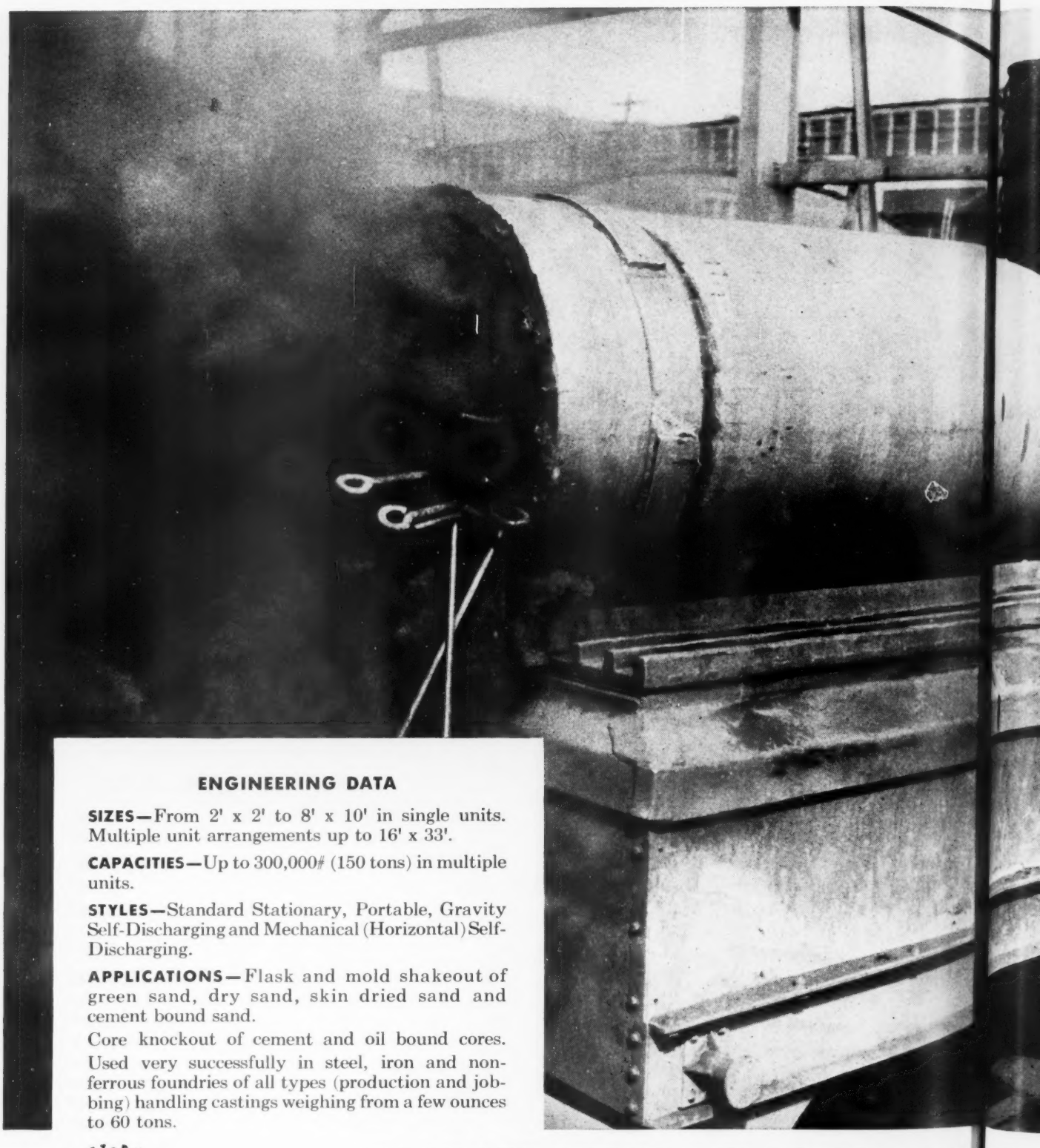
Sodium Nitrite · Para-dichlorobenzene · Ortho-dichlorobenzene · Monochlorobenzene
Ammonium Chloride · Sesquicarbonate of Soda

Floatex Shakeout Saves 7



ENGINEERING DATA

SIZES—From 2' x 2' to 8' x 10' in single units. Multiple unit arrangements up to 16' x 33'.

CAPACITIES—Up to 300,000# (150 tons) in multiple units.

STYLES—Standard Stationary, Portable, Gravity Self-Discharging and Mechanical (Horizontal) Self-Discharging.

APPLICATIONS—Flask and mold shakeout of green sand, dry sand, skin dried sand and cement bound sand.

Core knockout of cement and oil bound cores.

Used very successfully in steel, iron and non-ferrous foundries of all types (production and jobbing) handling castings weighing from a few ounces to 60 tons.

HEWITT-ROBINS INCORPORATED

HEWITT-ROBIN

EXECUTIVE OFFICES, STAMFORD, CONNECTI

7½ Man-Hours Per Casting

Floatex Shakeout Scores Knockout On Cement-Bonded Sand Core In Less Than 20 Minutes!

CUSTOMER'S PERFORMANCE RECORD

EQUIPMENT:

72" x 120" Hewitt-Robins Portable Floatex® Shakeout.

LOCATION:

The Pusey and Jones Corporation Foundry, Wilmington, Delaware.

CASTING:

Thin-walled paper mill autoclave liners weighing 8000 pounds—measuring 9'5" by 40" diam.—sealed at one end.

CORE:

Hard cement-bonded sand weighing approximately 8000 pounds.

PERFORMANCE:

Less than 20 minutes total knockout time . . . 7½ man-hours saving per casting. During 30 months of operation, in spite of terrific metal-to-metal impact during high-speed knockout, absolutely no casting damage.

RESULT:

Pusey & Jones report unit paid for itself in just one year of operation because of time saved and lack of casting damage.

CHECK FOR INFORMATION ABOUT THESE JOB-TESTED PRODUCTS FOR YOUR FOUNDRY

- ☐ FOUNDRY SHAKEOUTS
- ☐ SSC UNIT

CONVEYORS:

- ☐ —Belt
- ☐ —Vibrating

BELTING:

- *☐ —Hot Materials
- *☐ —General Conveyor
- ☐ —Woven Wire

HOSE:

- *☐ —Air
- *☐ —Water
- *☐ —Steam
- *☐ —Fire
- *☐ —Twin-Weld®
- *☐ —Servall®
- *☐ —Water Suction

- ☐ BUCKET ELEVATORS
- ☐ MECHANICAL FEEDERS
- ☐ SAND SCREENS
- ☐ CAR SHAKEOUTS
- ☐ SCREEN CLOTH
- ☐ IDLERS
- ☐ BELT CLEANERS
- *☐ RUBBERLOKT® BRUSH

*For immediate information about these industrial rubber products, call your Hewitt Rubber Distributor. (See "Rubber Products" Classified Phone Book).

Hewitt-Robins Incorporated
666 Glenbrook Road
Stamford, Connecticut

NAME

TITLE & COMPANY

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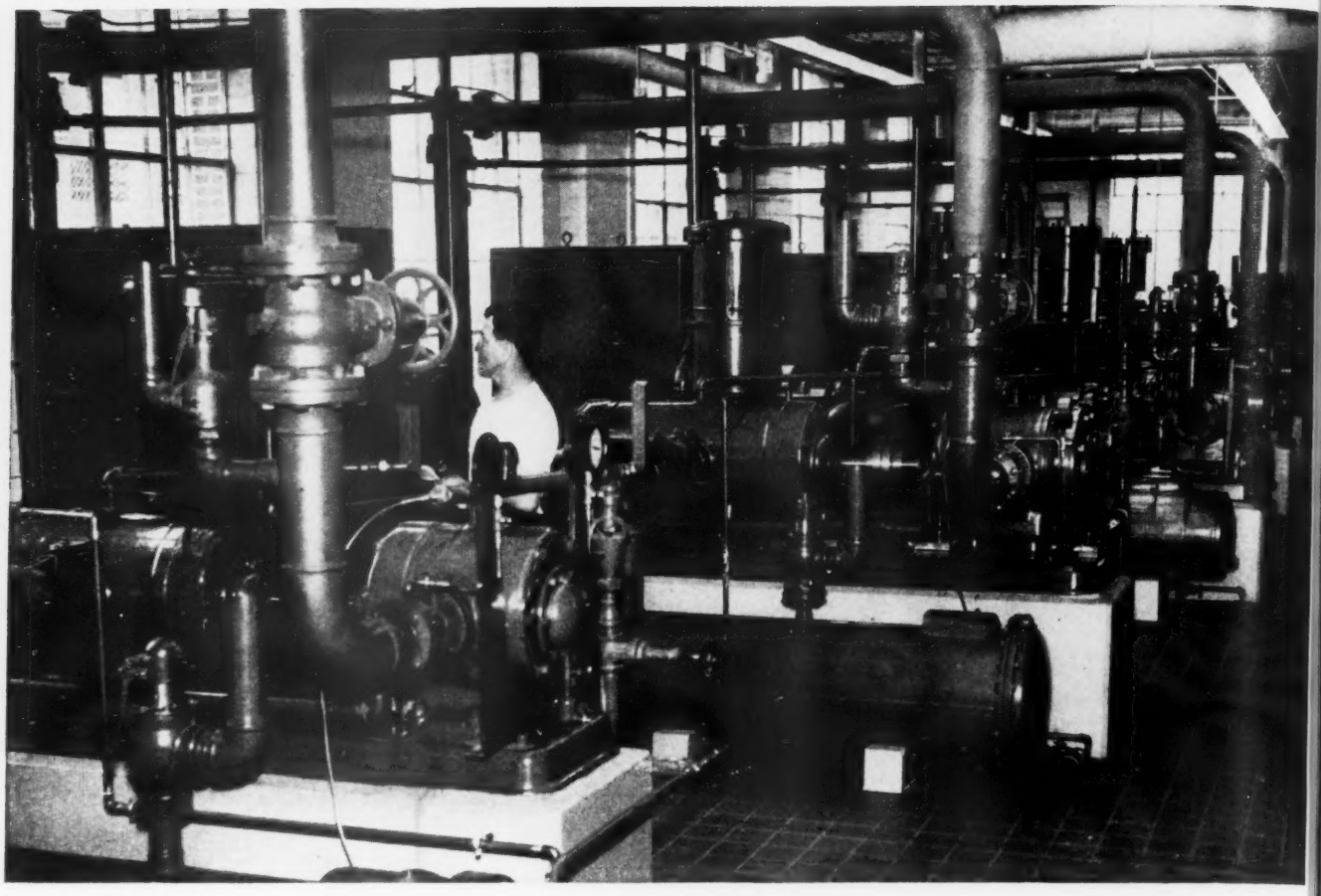
IGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, France • Robins Conveyors (S. A.) Ltd., Johannesburg • EXPORT DEPARTMENT: New York City.



mold Air Power to your needs as this founder does

Six Fuller Rotary Compressors work day after day at Textile Machine Works, Reading, Pa.

Compressed air, produced in one central location, is used for many foundry operations at Textile Machine Works, Reading, Pa., makers of full-fashioned hosiery machinery.

Many molding operations are mechanized at Textile Machine Works, using compressed air. Sand supply-hopper gates are opened by compressed air, jolt-squeeze machines operate with compressed air, pattern plates are removed from molds with air—sand blasting, core making, compacting flask sand, handling push-pallet plates—a whole group of foundry operations simplified by the use of compressed air supplied by Fuller Rotary Compressors.

Starting with a two-stage Fuller Rotary Compressor in 1943, this company has added more compressors as production was increased, until recently the sixth unit was added, supplying a total of 6800 cfm at 125 psi. Each addition was a Fuller Rotary Compressor, a sure indication of reliability and economy of operation.

In your own foundry or process operations, compressed air can save time and money—especially when it is supplied by reliably efficient Fuller Rotary Compressors. Don't overlook the advantages of *air power*—put it to your work—write now for complete information.

Fuller

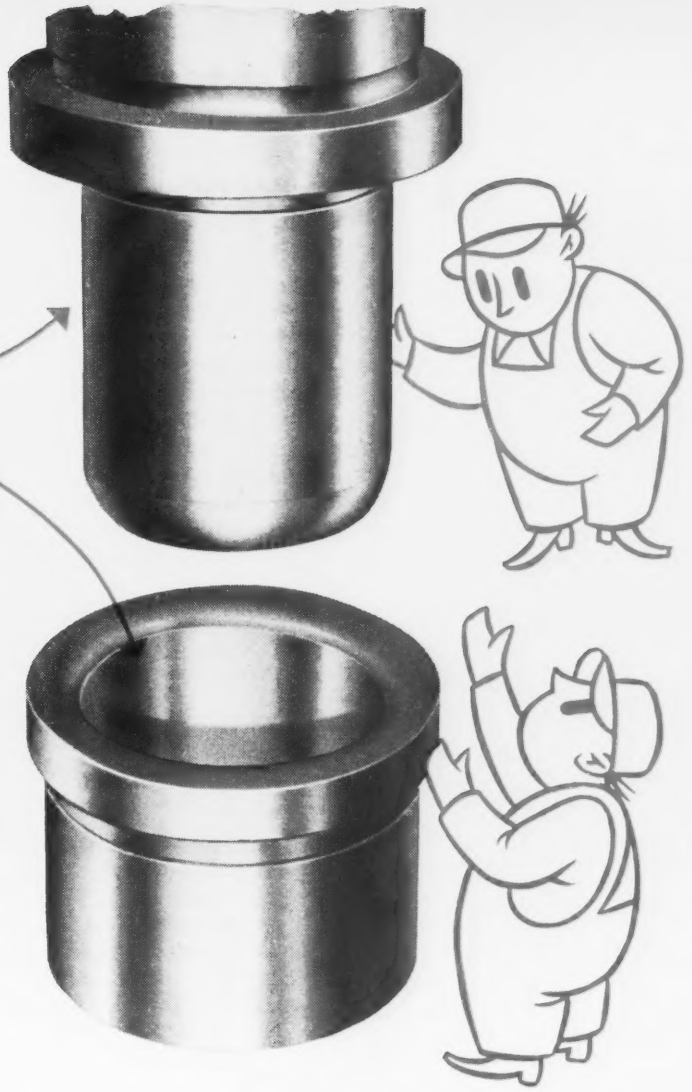
FULLER COMPANY
Catasauqua, Pa.

Branch Offices: Chicago • San Francisco • Los Angeles • Seattle • Birmingham

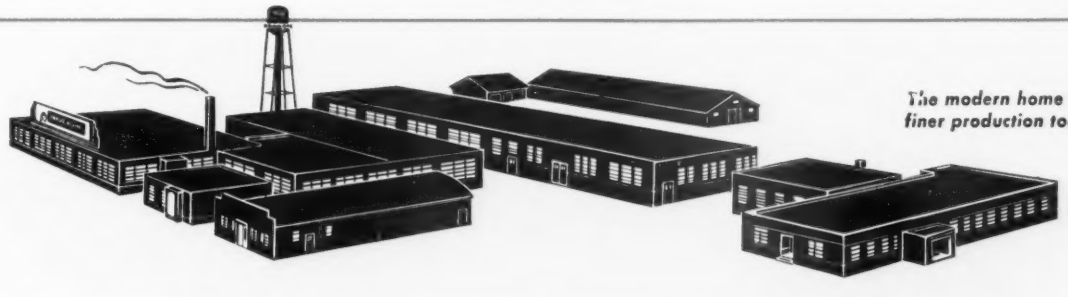
Pioneers of high-efficiency vane-type rotary compressors

C-236
2046

carburized and hardened steel wearing surfaces and ductile cores mean long life for UNIVERSAL flask pins and bushings



It's no easy trick to produce flask pins and bushings that are hard enough to take long, rigorous wear, and yet have cores ductile enough to resist breakage and rough treatment in the foundry. However, Universal has accomplished this difficult task. Universal flask bushings are double quenched and double drawn to produce a fine grain structure that will withstand considerable stress and strain without breaking or chipping. The wearing surfaces are carburized and hardened to reduce wear and prolong the life of both pin and bushing. Universal flask pins and bushings are precision ground to extremely close tolerances to insure instant, accurate alignment of cope and drag. Plain, taper and threaded series pins and bushings are available in a complete range of sizes as regular stock items. For complete information about Universal flask pins and bushings, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or the home office.



The modern home of finer production tools

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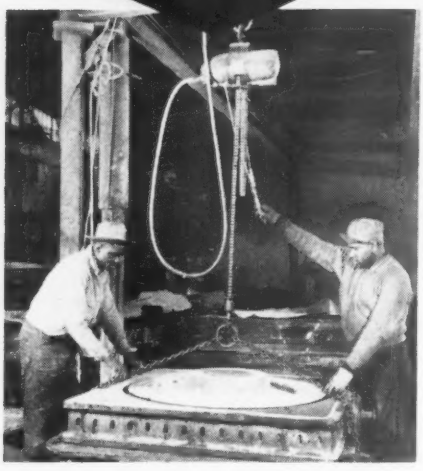
UNIVERSAL ENGINEERING COMPANY **FRANKENMUTH 4, MICHIGAN**

THE HOIST WITH
fingertip control



Here is the most accurately controllable hoist ever devised...

KELLER
Air Hoist

It is operated by an air valve that you can "crack" as little or as much as you like—from the barest creep to 17 fpm full speed, or any speed between.

Positive displacement piston-type air motors assure positive movement up or down. Centrifugal brake holds load immovable in any position.

Other Keller Air Hoist features include:

- Can't Burn Out, even when stalled
- Light Weight—1,000 lb air hoist weighs only 30 lb
- Low Maintenance
- Continuous Duty — can be used hours (or days) continuously without shortening motor life

SEND FOR DETAILED INFORMATION

KELLER
Pneumatic Tools

KELLER TOOL CO., GRAND HAVEN, MICH.

Readers' Comment

Industry Help Appreciated

To The Editors:

It was with a great deal of interest that I read your editorial entitled "Still Room for Improvement" in the April issue of Foundry.

I appreciate the complimentary remarks concerning the Copper Division Foundry Branch.

Without the patience and understanding shown by the foundry industry during a time which was bound to be difficult for all of us, our task here in Washington would have been most difficult to achieve.

William A. Meissner Jr.

Deputy Director, Copper Division
National Production Authority
Washington

* * *

"Many Favorable Comments"

To The Editors:

I just wanted to write you a note telling you that we have had many favorable comments about the article you did on the Cleveland Foundry for Foundry magazine. One of my former associates wrote me all the way from Paris, France, mentioning that he had seen and enjoyed the article.

I have talked to several of our Detroit executives who made favorable comments. It is this kind of reporting that makes for good relationship between industrial concerns and the technical press.

E. C. Jeter
Plant Manager

Cleveland Foundry
Ford Motor Co., Cleveland

* * *

Training Engineers from Abroad

To The Editors:

As you well know, several teams of experts have come over from Europe to the United States under auspices of the Mutual Security Agency to look at American methods in engineering.

Some time ago another type of project was started by which young engineers get in-plant training in different factories in your country during a total time of eight months.

I am one of a number of engineers who came over from Holland one month ago on one of these projects. Our project manager is Carl S. Coler of the Methods Engineering Council in Pittsburgh, 718 Wallace Ave. Mr. Coler finds assignments for us, and we try to find places and get as much information as we can ourselves.

In Holland, I am with Diepenbrock & Reigers in Ulft, usually known as DRU. We cast and enamel bathtubs and we make enameled cast iron and also some enameled sheet metal kitchen ware. We are also a jobbing foundry.

At the moment I am assigned to the Griswold Mfg. Co.

The subjects I am most interested in while I am here are materials handling and efficient production methods in the mechanical foundry and in the enameling plant. I also want to get acquainted with the American way of life, as this is an important influence on production in this country. I would appreciate it very much if you could advise me as to which plant to work at or to visit. Also I would be very grateful for any information regarding the equipment these plants have.

W. J. Leyds

c/o Griswold Mfg. Co.
Erie, Pa.

* * *

Ralph Lee Rings the Bell

To The Editors:

Man-to-man, or any way you want to size it up, that Ralph Lee piece in the April issue was one of the most interesting, clear and simple, but emphatic and provocative expositions of "Public Relations" which I have had the pleasure of reading or hearing in a long, long time.

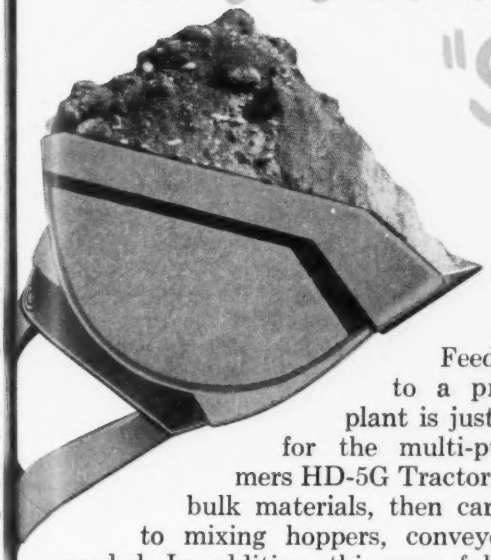
The subject more frequently than not is dealt with in four-syllable words and redundantly evasive or obscurative or down-right confusing language and symbols stemming out of some possibly laudable, but certainly unenlightening, ivory-tower philosophical meanderings.

But that was anything but the case, in *this* case. Ralph Lee obviously was speaking authoritatively, and definitively, from a long background of practical experience and understanding. And when he got through with his job, there was plenty of good reason to assume that his readers will have been endowed with a much fuller and more effective *understanding*. That is bulls-eyeing the target, for sure.

(Concluded on page 98)

FEEDING A PRODUCTION-HUNGRY PLANT WITH A

One Cubic Yard "Spoon"



Feeding raw materials to a production-hungry plant is just one of many uses for the multi-purpose Allis-Chalmers HD-5G Tractor Shovel. It receives bulk materials, then carries them directly to mixing hoppers, conveyors or storage as needed. In addition, this powerful crawler excavates for new construction, handles coal, cleans up and loads waste . . . also clears snow and maintains yards and parking areas.

Interchangeable attachments, such as bulldozer blades, special buckets, lift fork, crane hook and trench hoe, add still further to its usefulness.

Tractor Shovels are also available on the three larger sizes of Allis-Chalmers crawler tractors, giving a range of standard buckets from one to four cubic yards — and up to seven cubic yards for light materials.

Let your Allis-Chalmers dealer tell you more about how you can mechanize your materials-handling the efficient tractor shovel way.

Keeps Production Moving—*Fast!*

The HD-5G feeds bulk materials in exact required amounts for uniform mixture — a full cubic yard at a scoop. In handling light materials, a two cubic yard bucket doubles output. Special fast reverse greatly speeds operation on short runs. This flexible tractor starts boosting production as soon as it's put on the job . . . no waiting for costly installations or changes in plant layout when you mechanize materials handling the Allis-Chalmers tractor shovel way.

Receives Material at Plant

The HD-5G scoops a heaping load of any material at the unloading trestle, then delivers it directly to mixing hopper, conveyor, or storage area. Truck wheels, idler and support roller bearings are positively sealed against grit and moisture and require lubrication only once every 1,000 hours. This feature alone saves about 30 minutes' greasing time a day.

Builds Storage Piles—*Anywhere*

This fast-working tractor maintains large stockpiles in the open or under a protective shed. Crawler tracks provide traction and flotation to work right up on the pile, enabling it to put many more cubic yards of material into a given area. Tracks also give long life in cullet and similar material as only steel can.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U.S.A.

TECHNICAL EXPERTS TO HELP SOLVE PRODUCTION PROBLEMS...
K-435
We believe that sales volume of Electro Specific Purpose grinding wheels is in proportion to the effective service we have rendered manufacturers at job-side.
Warrant for holding fast to that belief is found in the record growth of our corporation and the technical contributions we have made to the industries using our products.
YOUR GRINDING WHEEL NEEDS are individual to your operation. If we could learn exactly what your individual requirements and working conditions are at your job-side . . . we would be in position to help you, as we have many production men, solve their grinding problems.
Without sales pressure, cost or obligation to follow, we suggest you write, wire or phone us to send a technical expert to your plant.
Electro
TRADE MARK
SINCE 1919
SPECIFIC PURPOSE GRINDING WHEELS
Standard and High Speed (vitrified and resin bonded) for nearly every grinding wheel purpose or need.
Electro Refractories & Abrasives Corporation
Manufacturing Plants, BUFFALO, N. Y. • Electric Furnace Division for the production of ELECTROCARB, Cap-de-la-Madeleine, P. Q., Canada
Regional Warehouse, Los Angeles 58, Calif. • Grant S. Diamond, President.
344 DELAWARE AVENUE • BUFFALO 2, N. Y.

(*Concluded from page* 96)

Nothing, for sure, could be more tersely stated—or more aptly expressed—than his incisive summarization that, in effect, ". . . we have public relations whether we want them or not, whether we're companies, departments or individuals . . . and public relations have a whale of a lot to do with our business." Et cetera.

It is an inevitable fact, of course, that a company or any entity starts having public relations the day it first opens its doors for business—whether or not it *wants* to recognize the fact or do anything realistic about building and improving on the foundation.

JACK O. FELT
Public Relations Counsel
18 *East* 41*st Street*
New York 17

* * *

Postal Trouble in South Africa

TO THE EDITORS:

I received yesterday, Apr. 9, 1953, a magazine for March. But you have made a mistake. Instead of sending FOUNDRY you have sent *Factory and Maintenance* in a FOUNDRY envelope. Please, will you send me FOUNDRY as I am very interested in it. I do not want to miss one issue as I am keeping all of them.

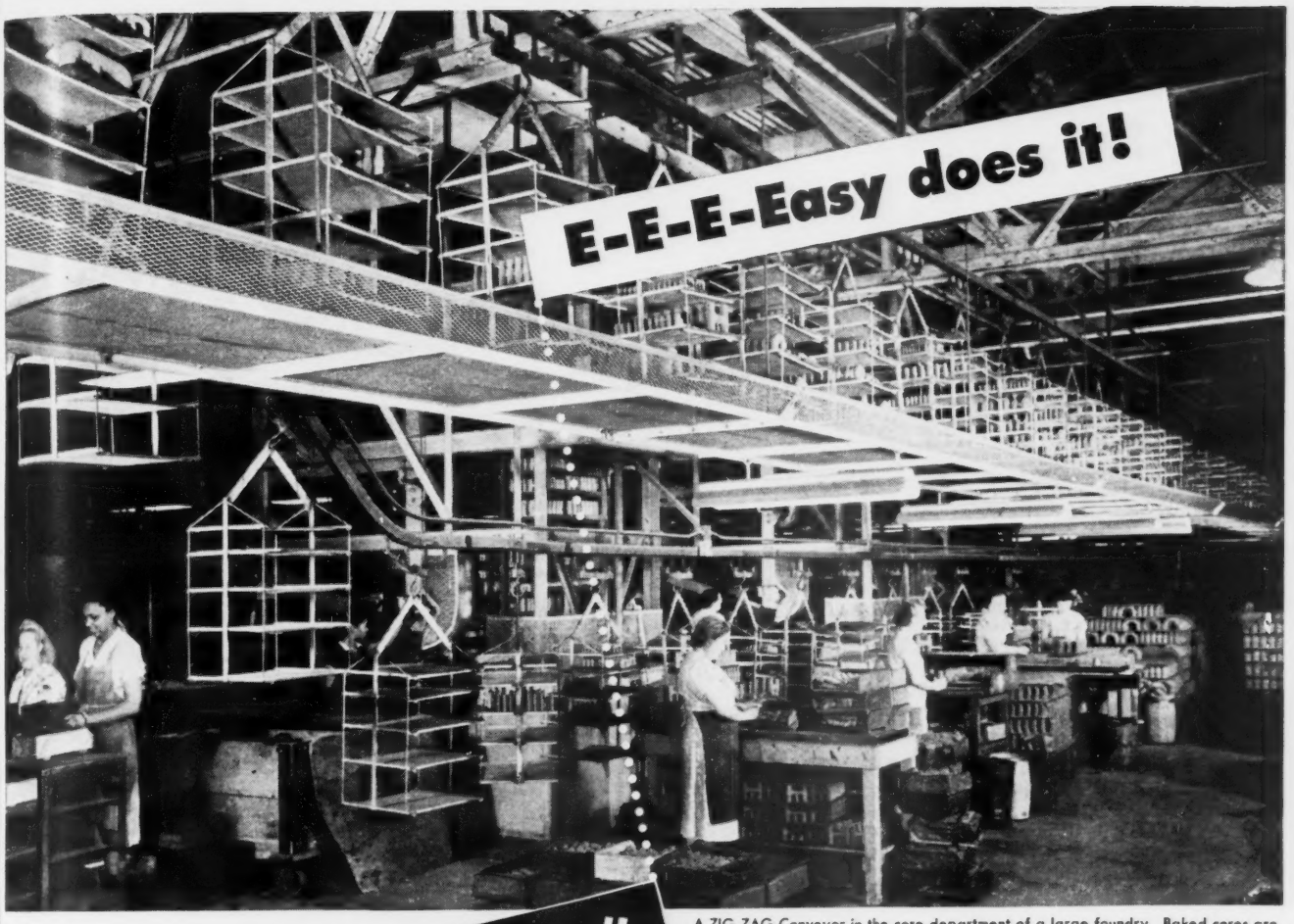
Every month I wait for FOUNDRY to come, and as soon as it arrives I stay up late to go through it, reading every article. As I have been more than 30 years in the foundry trade in Holland, and also in South Africa, Indonesia and the Malaya States, I do not like to miss it.

Your FOUNDRY magazine is the best in the world. Particularly everything on patternmaking I keep up to date. I am very much interested in plastic patterns as I am in charge of a pattern shop of the Simplex Electric Co. (mass production of thin castings). Also I am a member of the Institute of British Foundrymen, Johannesburg Branch, and was founder and past secretary of the institute in Capetown. I have tried to introduce new methods, but it is very difficult here in South Africa.

With thanks for the many hours of pleasure and interest of your very fine magazine on foundry matters and thanks to those who contribute to it. I hope to receive it always.

K. J. ZWANZIGER
14 *Hagart Ave.*
Springs, Transvaal
South Africa

Editor's Note: Rough handling of mail abroad occasionally will cause magazines to lose their envelopes. In this case it apparently happened to more than one magazine, and the copies were switched in being restored to their envelopes.



A ZIG-ZAG Conveyor in the core department of a large foundry. Baked cores are transferred direct from ovens to conveyor carriers. While cooling, cores move via upper elevation to checking and ganging benches. This installation, over 500 feet overall and constructed entirely of stock sections, is powered by two synchronized drive units.

with R-W "Zig-Zag"® Continuous Power Conveyor

For safely moving fragile cores and castings in aluminum and brass foundries, you can't beat a ZIG-ZAG continuous Power Conveyor with its smooth, jerk-free flow at speeds from 1 inch to 60 ft. per minute.

ZIG-ZAG operates just like "water through a pipe"—it's a steel tube-like track and specially constructed motor-driven chain carrying unit loads up to 125 pounds each. And it's highly flexible, too—for changes or relocation, take it down here and put it up there, and in most cases *use all of the parts.*

AND THERE'S R-W EQUIPMENT FOR HEAVIER JOBS, TOO

TRU-TRED Monorail Track and Ball Bearing Trolley Systems. For manual or high-speed electrical handling of loads from 500 pounds to 4 tons. Wide choice of TRU-TRED track sizes with broad range of capacities and spans eliminates need for costly superstructure.

R-W Heavy Duty Cranes. I-beam construction identical with TRU-TRED Track. For use with manual or electrically operated trolleys or hoists.

Write for details—or have an R-W engineer consult with you at no obligation.

Zig-Zag is Engineered for Economy and Flexibility

- Horizontal and vertical units alternate in a continuous chain traveling through special steel tubing.
- Complete flexibility for installation in any plant. Easily installed, easily changeable to conform to plant alterations.
- SAFE—all moving parts are fully enclosed.
- Low first costs. Low Power Factor.
- Standard horizontal or vertical curves —two-foot radius.

Richards-Wilcox Mfg. Co.

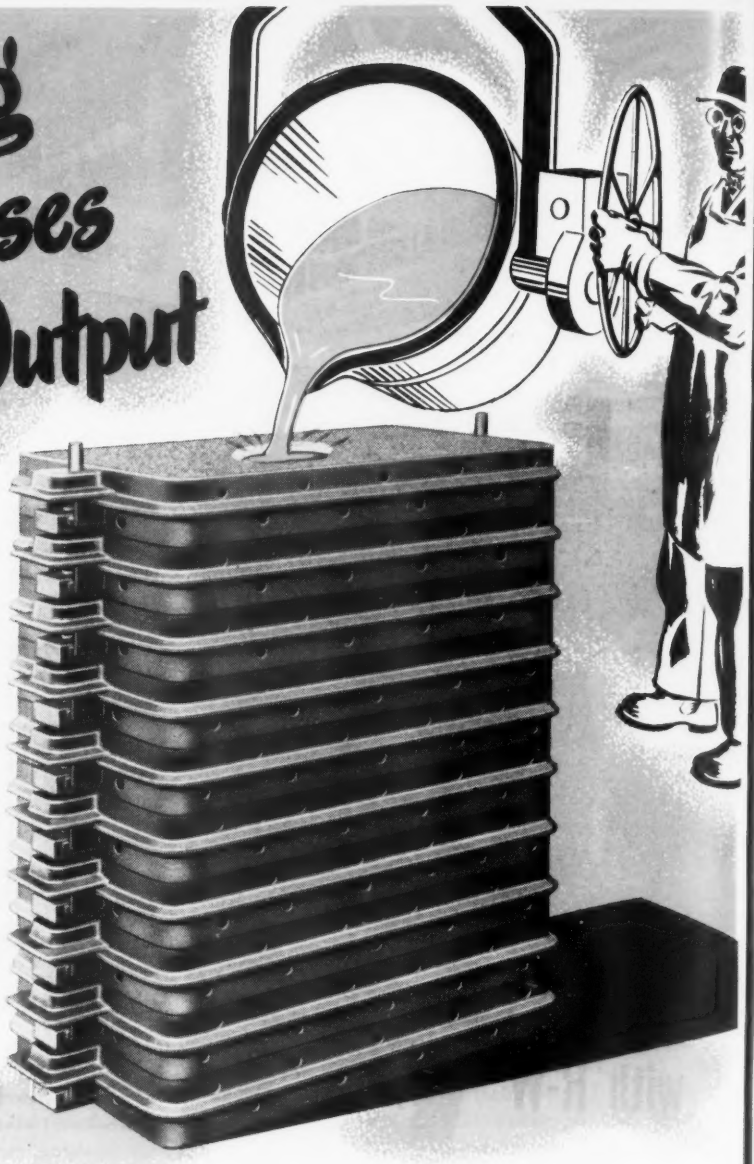
"A HANGER FOR ANY DOOR THAT SLIDES"

466 THIRD STREET, AURORA, ILLINOIS

1880 RICHARDS WILCOX R-W AURORA TRADE MARK Reg. U. S. Pat. Off. 1953

SLIDING DOOR HANGERS & TRACK • FIRE DOORS & FIXTURES • GARAGE DOORS & EQUIPMENT • INDUSTRIAL CONVEYORS & CRANES • SCHOOL WARDROBES & PARTITIONS • ELEVATOR DOOR OPERATING EQUIPMENT

Stack Molding Greatly Increases Your Casting Output



You want to modernize your foundry and step up casting production! Then be sure to investigate Sterling stack molding technique. It enables you to pour ten, or even twelve, sections at a time.

In stack molding, the molds are made in flask sections stacked one above another to a height of 10 or 12 sections. A common sprue through the stack feeds the molten metal to runners leading to individual casting cavities. The increased amount of hot metal in relation to the total flask volume generates tremendous heat with a corresponding increase in gas pressure. That's why —

Sterling Steel Flasks should be used for stack molding. They are ruggedly constructed of special rolled steel to withstand terrific pressures. A reinforcing rib around the side prevents distortion and misalignment of the stacked molds. Successfully job-tested in high production foundries over a period of years. Consult Sterling for your flask requirements. Write for new Catalog No. 64A just off the press.

STERLING WHEELBARROW CO.
MILWAUKEE 14, WISCONSIN, U. S. A.

A 5692-1PG-R

Let's Make It a Branch, Now

When the National Production Authority was organized under the Defense Act of 1950, those in charge copied the setup of the old War Production Board. No effort was made to correct the inequities and mistakes of the World War II organization.

As a result, problems in the foundry industry were quite acute, and only the hard work of the trade associations serving the various phases of the foundry industry brought some correction to mistaken conceptions of government officials and permitted foundries some degree of success in serving the nation.

Although war continues in Korea, the materials situation has improved to the point where the defense act is being allowed to expire. The NPA will be discontinued on June 30, and those functions still required in the defense picture will be transferred to the Department of Commerce, where it will operate under the Office of Defense Mobilization. To provide guidance for a future defense effort, should the emergency develop, the NPA now is completing a history of its organization and operation.

Because the essentiality of castings in any emergency effort still has not been recognized completely by Washington, the NPA organization is not adequate. If this important industry is to render maximum service to the nation, both in the immediate future and in case of a new emergency, corrections should be made at once. The greatest urgency lies with the ferrous foundry industry.

As was requested over a year ago, the Ferrous Castings Section should be elevated to a higher echelon by making it the Ferrous Castings Branch of the Iron and Steel Division. The branch should be headed by a deputy director of the Iron and Steel Division. This would carry planning for the industry to the policy making level where foundrymen would provide the knowledge and background necessary to avoid some of the serious blunders made during World War II and the most recent defense program by men not familiar with the foundry problem. Such a setup could have prevented unjust charges against the steel casting industry in connection with the cast armor program and the heavy press fiasco. This phase should be undertaken at once.

To provide the complete organization for a future emergency, the Ferrous Branch should include a Gray Iron Castings Section, a Malleable Iron Castings Section, a Steel Castings Section and a High Alloy Castings Section. The branch also should have the organization to handle extension and improvement of facilities and procurement of equipment, and correlation of technical and metallurgical problems.

Now is the time for Washington to correct the inequities in the ferrous castings organization.

Frank G. Steinebach

Editor

CONVENTION REPORTS . . .

Point to Industry's Progress

Opening day of the AFS convention found registration headquarters at the Hotel Sherman a bustling spot

TANGIBLE evidence of technical progress in the foundry industry was contained in the numerous papers and discussions presented at the 57th annual convention of the American Foundrymen's Society in Chicago, May 4-8. The interest of foundrymen in these developments was evidenced by a registered attendance at the five-day meeting of more than 3500, a record for nonexhibit conventions.

Practically all sessions drew large audiences, and standing-room-only conditions prevailed on a number of occasions—particularly when shell molding was the discussion subject. Other topics which commanded more than usual attention because of recent developments included the casting of titanium, high-pressure molding and sand reclamation.

Business Meeting—A review of a year of accomplishments was presented by I. R. Wagner, national president, in his address at the annual AFS business meeting. Membership of the society now is slightly in excess of 11,000, a new record, he announced. Approximately 95 per cent of all members are affiliated with a chapter. Three new chapters were established during the past year, including the Mid-South Chapter at Memphis, Tenn., and two student chapters.

Mr. Wagner paid tribute to the more than 600 industry men serving on technical committees of the society. He pointed out that membership on technical committees is a voluntary one, and urged foundrymen to volunteer their services in this work.

Mr. Wagner said that good results are being obtained from the seven research projects currently being sponsored by AFS, and expressed the belief that these projects should be multiplied and more money be made available for the work.

In the publication field, the society has issued seven new books since a year ago. In the educational field, the society proposes the hiring of a full-time director of educational activities.

The safety, hygiene and air pollution program of the society, a 10-year project, has succeeded in raising $75,000 of the $350,000 it proposes to spend on this work. He urged the support of industry in this project, and referred to proposed legislation in various states to enforce safety and air pollution measures.

The new headquarters building of the society will be started shortly, a site having been obtained in Des Plaines, Illinois, a Chicago suburb.

National Secretary William W. Maloney cast a unanimous ballot for the officers and directors named by the nominating committee. Succeeding Mr. Wagner as president in 1953-54 will be Collins L. Carter, president, Albion Malleable Iron Co., Albion, Mich. Elected vice president was Frank J. Dost, president, Sterling Foundry Co., Wellington, O. Directors elected for three years are:

Edward C. Hoenicke, Foundry Division, Eaton Mfg. Co., Detroit; Martin J. Lefler, Oliver Corp., South Bend, Ind.; Chester V. Nass, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago; Victor F. Stine, Pangborn Corp., Hagerstown, Md., and G. Ewing Tait, Dominion Engineering Works Ltd., Montreal. Retiring President I. R. Wagner was elected to a one-year directorship. New officers and directors will take office after the annual board meeting this summer.

Prof. George J. Barker, University of Wisconsin, spoke briefly in behalf of activities of the Educational Division, of which he is chairman. He pointed to the effective work being done by the apprentice committee, and stated that 269 entries were received in the annual apprentice contest this year. President Wagner then presented certificates and prizes to the five first-place winners in the various divisions of the 1953 contest.

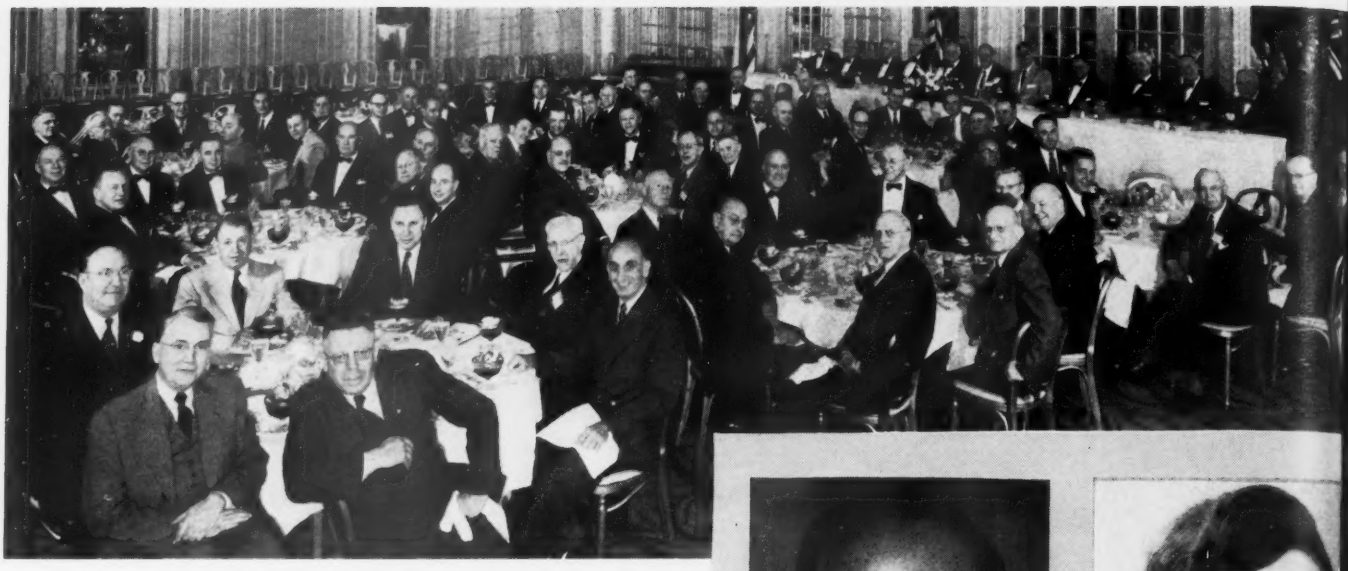
COLLINS L. CARTER
President-elect

President I. R. Wagner reports a year of progress at the society's annual business meeting

FRANK J. DOST
Vice President-elect

Awards were received by the following apprentices: William E. Morehead, Caterpillar Tractor Co., Peoria, Ill., gray iron molding division; Robert J. Luckenbill, Dodge Steel Co., Philadelphia, steel molding division; Joseph LoPatriello, AiResearch Mfg. Co., Los Angeles, nonferrous molding division; Richard Sautel, Universal Pattern Works, Rockford, Ill., wood patternmaking division; George M. Smith, Automotive Pattern Co., Detroit, Mich., metal patternmaking division.

Second and third place apprentice winners, respectively, in the 1953 contest were announced as follows: Gray iron molding—John J. Diaz, Brown & Sharpe Mfg. Co., Providence, R. I., and Davey Gambcorta, Olney Foundry Division, Link-Belt Co., Philadelphia. Steel molding—Marcel Lalonde and Ghislain Lefrancois, both of Canadian Car & Foundry Co. Ltd., Montreal. Nonferrous molding—Carlos Gonzales, AiResearch Mfg. Co., Los Angeles, and Gaston Vigneault,



Present and past officers, directors, medalists and honorary life members at the Alumni dinner

EDWARD C. HOENICKE

G. EWING TAIT

Miller's Brass Foundry Reg'd., Three Rivers, Que. Wood patternmaking—William Ryerson, Guilford Pattern Works, Rockford, Ill., and William M. Zimmer Jr., Arnette Pattern Co., Granite City, Ill. Metal patternmaking—Philip D. McDonald, Caterpillar Tractor Co., Peoria, Ill., and Walter Lewandowski, Ford Motor Co., Dearborn, Mich.

Hoyt Lecture—The Charles Edgar Hoyt Annual Lecture following the society's business meeting was presented by James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich. Entitled "Outstanding Opportunities for the Foundry Industry," the lecture comprised a most interesting discussion of significant developments in the industry. Mr. Smith divided his remarks into the following broad headings: Molding methods and materials; metallurgy of cast iron; heat treatment of cast iron; methods engineering, and educational programs for the foundry industry.

Mr. Smith referred to sand conditioning resins in discussing molding methods and materials, and called attention to work now being done in developing pressure molding using this type of sand additive. The method utilizes a squeeze of 500 psi rather than the 50 psi currently employed. Molds produced by this method deliver castings of excellent finish and close dimensional tolerances.

Calling the shell molding and coremaking process "one of the greatest technical developments of our time," Mr. Smith stated the process lends itself to complete mechanization of the molding operation for long production runs. He hopes that as this technique develops, it will be possible to cast many surfaces to much closer tolerances. At present shell molding stands between the lost-wax and green sand methods for dimensional accuracy. The high cost of phenolic resins at present is a limiting factor to the process' wider use.

A much appreciated innovation was here introduced to the Hoyt lecture. Mr. Smith employed an extremely fine color motion picture to illustrate shell making practice at the Saginaw Malleable plant.

Advancements in cast iron metallurgy were next considered. Mr. Smith called attention to the development of nodular iron, the ability to obtain low-sulphur iron from cupolas and furtherance in the use of the basic-lined cupola. The speaker described the marked growth in use of pearlitic malleable, which has had wide acceptance in the automotive industry, household appliance field and in the small arms and ammunitions programs during World War II and our present emergency.

He also described Bisbo iron, recently developed by the GMC research laboratory. The metal is made through additions of small amounts of bismuth and boron to white iron base metal and malleablized to form a pearlitic structure. This metal lends itself to heavier structures than malleable iron normally is cast, and Mr. Smith believes there is a large potential market for the metal.

To meet the demands of the design engineer for intricate castings with thinner metal sections, the speaker indicated the industry will turn increasingly to duplex melting, using the cupola and electric furnace. He also believes that use of heat treatment by gray iron foundrymen will increase in the near future. Mr. Smith discussed briefly annealing for stress relief, machinability, quenching for higher strength and concluded with a description of the martempering process.

Methods engineering, Mr. Smith stated, provides the

opportunity to increase employee effectiveness, eliminate idle time and cut down heavy physical labor. These in turn improve working conditions and quality of product. Another technicolor motion picture, entitled "Methods Engineering as Applied to the Foundry Industry," was then presented to illustrate these points.

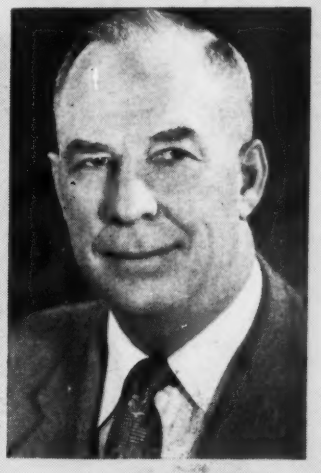
In discussing educational programs for the foundry industry, Mr. Smith praised the FEF and the work it is doing in attracting young men and training them for the industry. However, this is not enough; and he offered the following suggestions which he believes will help the industry attain high-caliber, well trained organizations:

1. Set up better procedures for selecting qualified personnel for supervisory positions, including selections from within the organization as well as outsiders.
2. Provide good training programs for supervisory and technical personnel.
3. Maintain effective apprentice programs for developing skilled tradesmen including patternmakers, tool and die makers, millwrights and electricians.
4. Acquaint more students in engineering schools with the opportunities in the foundry industry by including foundry as part of the curriculum in more schools.
5. Try to attract more graduate engineers into the industry to accelerate the development work necessary to keep abreast of competing industries.
6. Support the Foundry Educational Foundation.

Annual Banquet—Hotel Morrison's Terrace Casino provided a colorful setting Wednesday evening for the AFS annual banquet, which was presided over by President I. R. Wagner. Program high-light was the awarding of gold medals and honorary life memberships to six individuals for distinguished service to the foundry industry and the society. The presentations were made by Fred J. Walls, International Nickel Co., Detroit, a past president of AFS and chairman of the Board of Awards, to:

William J. Grede, Grede Foundries Inc., Milwaukee (William H. McFadden Medal); Daniel E. Krause, Gray Iron Research Institute, Columbus, O. (John H. Whiting Medal); William Romanoff, H. Kramer & Co., Chicago (Joseph S. Seaman Medal); James H. Smith, Central Foundry Division, General Motors Corp., Saginaw, Mich. (Peter L. Simpson Medal); Prof. George

VICTOR F. STINE



MARTIN J. LEFLER

CHESTER V. NASS

Newly elected directors (left) to AFS board. View of the speaker's platform at annual business meeting shown below

Opportunities for the Future

"I look forward with a great deal of optimism to the future. In our hands lie outstanding opportunities for the foundry industry. This great industry of ours in future years will have engineering markets and stature in the economy of America in direct proportion to what we men in the industry today do in the years immediately ahead of us. We have been told that the future of the foundry industry is bright, but it can only be so as a reflection of our own endeavor. This responsibility is entirely ours, both individually and collectively! If we meet these responsibilities and take advantage of our opportunities, we cannot help being successful in this very interesting and dramatic business." — *From the Charles Edgar Hoyt Lecture by James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich.*

JAMES H. SMITH

J. Barker, University of Wisconsin (honorary life membership); I. R. Wagner, Electric Steel Castings Co., Indianapolis (honorary life membership).

Principal speaker at the banquet was Dr. George S. Benson, president, Harding College, Searcy, Ark., whose address, entitled "Education for Free Enterprise," comprised a strong plea that a better understanding of the underlying factors responsible for the country's development be instilled in the American people.

The annual Alumni dinner, attended by present and past officers and directors, medalists and honorary life members, was held at Hotel Sherman on Thursday evening, with Walter L. Seelbach, past president, presiding. The program featured an interesting talk, "Israel and Its Industry," by Hyman Bornstein, past president, who recently served as metallurgical advisor to the Israel government.

The annual Canadian dinner, for a number of years a regular feature of AFS conventions, measured up fully to records of good fellowship established in former years. Held Tuesday evening in Hotel Morrison, it was presided over by National Director J. J. McFadyen, Galt Malleable Iron Co. Ltd., Galt, Ont. Tribute was paid Mr. McFadyen, who regretfully announced it would be the last occasion on which he would have the pleasure of serving as chairman of the annual dinner. As has been customary, the program included brief, impromptu remarks rather than formal speeches. G. S. Diamond, Electro Refractories & Abrasives Corp., Buffalo, announced that plans were under way for a foundry conference in Buffalo, Sept. 17-18, with the Ontario and Western New York Chapters as co-sponsors.

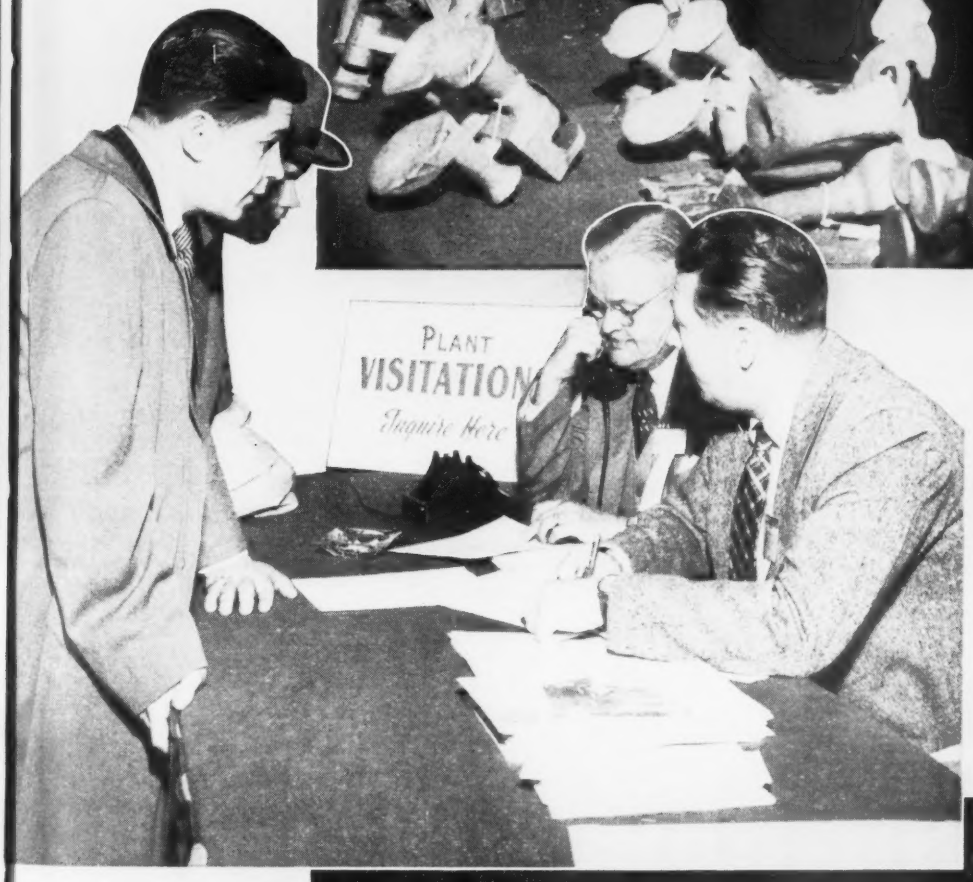
Visiting foundrymen took advantage of the opportunity to visit the approximately 40 plants in the Chicago district that were open for inspection during the week. Arrangements for the visitations were made by a Chicago Chapter committee headed by H. K. Briggs, Miller & Co., and L. H. Rudesill, Griffin Wheel Co. Of particular interest was the Crane Co.'s malleable and brass foundries, which attracted a group of 316 for a Wednesday morning tour.

Reflecting the increased attention the foundry industry and the AFS are giving to safety and dust control, an expanded program of technical papers was presented at the Chicago convention by the Safety, Hygiene and Air Pollution Committee. Four sessions were conducted and attracted considerable interest. In addition, the committee sponsored a booth at registration headquarters where foundrymen had an opportunity to discuss their problems with committee members. A report on papers given at the technical sessions will be presented in next month's issue.

Shell molding continues to be the outstanding attention-getter at foundry meetings. Different phases of the process were discussed at several sessions sponsored by various divisions, as well as in the Hoyt Lecture, before large audiences. Resumes of the discussion on this subject will be found in this issue under the individual division program reports starting on the following pages: Light Metals, p. 159; Patternmaking, p. 156; Core and Molding Sand, p. 152.

Equipment for coremaking featured the Plant and Plant Equipment Committee's session, with James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., and H. W. Johnson, Wells Mfg. Co., Skokie, Ill., presiding. (*Please turn to page* 150)

Convention visitors examine some of the numerous entries in the 1953 apprentice contest of the AFS



Visits to many plants were made by foundrymen during the convention. H. K. Briggs (at phone) headed the Chicago Chapter committee handling arrangements for plant visitations

First-prize apprentice contest winners, left to right: W. E. Morehead, R. J. Luckenbill, Joseph LoPatriello, G. M. Smith and R. Sautel

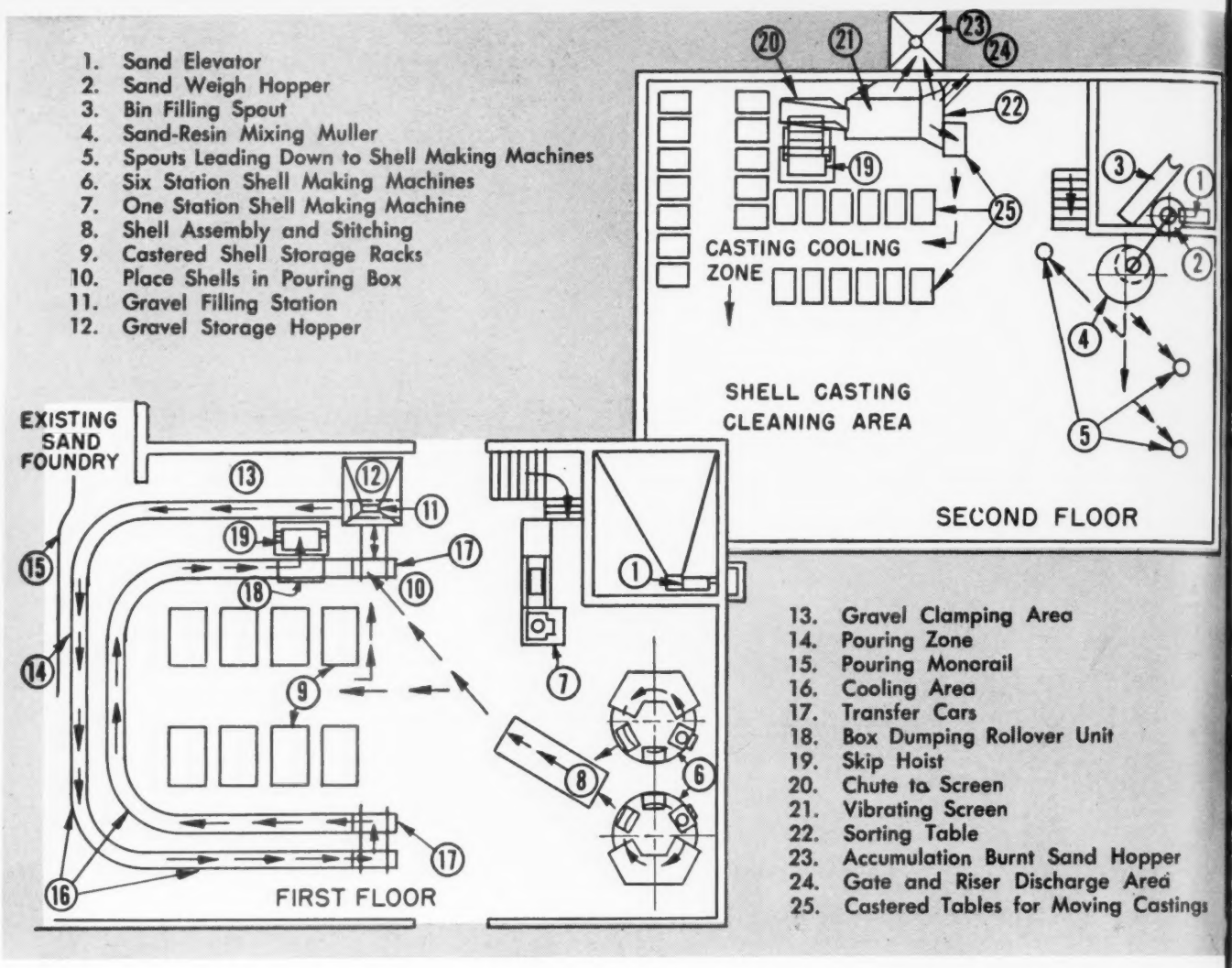

1. Sand Elevator
2. Sand Weigh Hopper
3. Bin Filling Spout
4. Sand-Resin Mixing Muller
5. Spouts Leading Down to Shell Making Machines
6. Six Station Shell Making Machines
7. One Station Shell Making Machine
8. Shell Assembly and Stitching
9. Castered Shell Storage Racks
10. Place Shells in Pouring Box
11. Gravel Filling Station
12. Gravel Storage Hopper
CASTING COOLING ZONE
SHELL CASTING CLEANING AREA
SECOND FLOOR
EXISTING SAND FOUNDRY
FIRST FLOOR
13. Gravel Clamping Area
14. Pouring Zone
15. Pouring Monorail
16. Cooling Area
17. Transfer Cars
18. Box Dumping Rollover Unit
19. Skip Hoist
20. Chute to Screen
21. Vibrating Screen
22. Sorting Table
23. Accumulation Burnt Sand Hopper
24. Gate and Riser Discharge Area
25. Castered Tables for Moving Castings

Fig. 1—Layout of Production Pattern & Foundry Co.'s shell molding foundry, Chicopee, Mass.

Laying Out a Mechanized

SHELL MOLDING FOUNDRY

By RAY OLSON
Production Pattern & Foundry Co.
Chicopee, Mass.

WE, AT Production Pattern & Foundry Co., have gone through a process of evolution which has confirmed our belief that shell molding is here to stay. The types of castings we have been making in our mechanized squeezer shop made only too obvious the advantages of the shell process.

The die was cast; we developed an estimate of equipment needed, floor area required and manpower needed to make and pour 3000 shell molds per day. With a few changes here and there, the pattern of our original estimate generally is taking shape.

Starting with the operations in sequence, we planned our sand and resin storage. Assuming that both halves of the shell together require an average of 5 lb of sand, 15,000 lb or 7½ tons of sand would be used per day. In actual practice we found that, due to the fact that our shell molds are somewhat larger than originally planned, (15 x 20 in. maximum), the weights run 6 to 7 lb instead of 5 lb, increasing the sand consumption.

Fig. 2—Gravel is used as back-up material. Pouring box holds four molds

We felt we needed sand storage space (well protected against moisture pickup) for a minimum of twenty working days. Actually, we finished with a bin built into one corner (against the railroad siding) of the new "Shell Foundry." This bin is about 15 ft square, built of heavily reinforced walls, plastered inside with waterproof cement. It extends well up through the second floor, and has about 125 tons capacity. A bucket elevator serves both for filling the bin, and also, with a two-position discharge spout, for filling a weigh hopper.

Our shell foundry is a two-floor operation, making use of gravity where it is an advantage. As may be surmised, our sand-resin mixing is done on the second floor, adjacent to the sand bin. The weigh hopper has 1400 lb capacity, equalling one batch in our muller which is used for blending the sand and resin. The resin storage is on the second floor, along the side of the muller.

With consumption of mixed sand at the rate of 2000 lb per hour, the muller capacity is more than adequate, as we find 15 minutes per batch ample mixing time. The sand-resin mix is fed down through the second floor into spouts which are directly lo-

Fig. 3—Clamping back-up gravel against the shell molds before pouring boxes arrive at the pouring zone over roller conveyor. This prevents finning

cated above the investment chambers of our shell making machines. This eliminates most of the handling of this material.

Shell molds are made on automatic machines produced by Shell Process Inc. With these machines, all of the functions pertaining to the making of the shells are adjustable, and the only routine function of the operator is lifting off the stripped shells. We use several sizes of shell molds, but have standardized on 15 x 20 in. shells wherever possible. With this size, we produce both halves of a shell mold with each cycle of a 20 x 30-in. machine.

With these machines, the operator has sufficient time during a 60-second cycle to inspect and stitch together both halves of the shell mold. With six-station machines, 20 x 30-in. shells are being ejected at the rate of one every 20 seconds. With this cycle, one stitcher is required for two six-station machines, in addition to the machine operators. If there are many cores to set, some additional help may be required.

It is but a few feet from the machines and shell assembly area to the conveyor where pouring boxes are set up. We use ordinary washed gravel as a backup material. This is mechanically handled, as will be explained through the sequence of our story. Inasmuch as we pour only cast iron, and the rate of solidification of this material is rather slow, we require backing up on most castings.

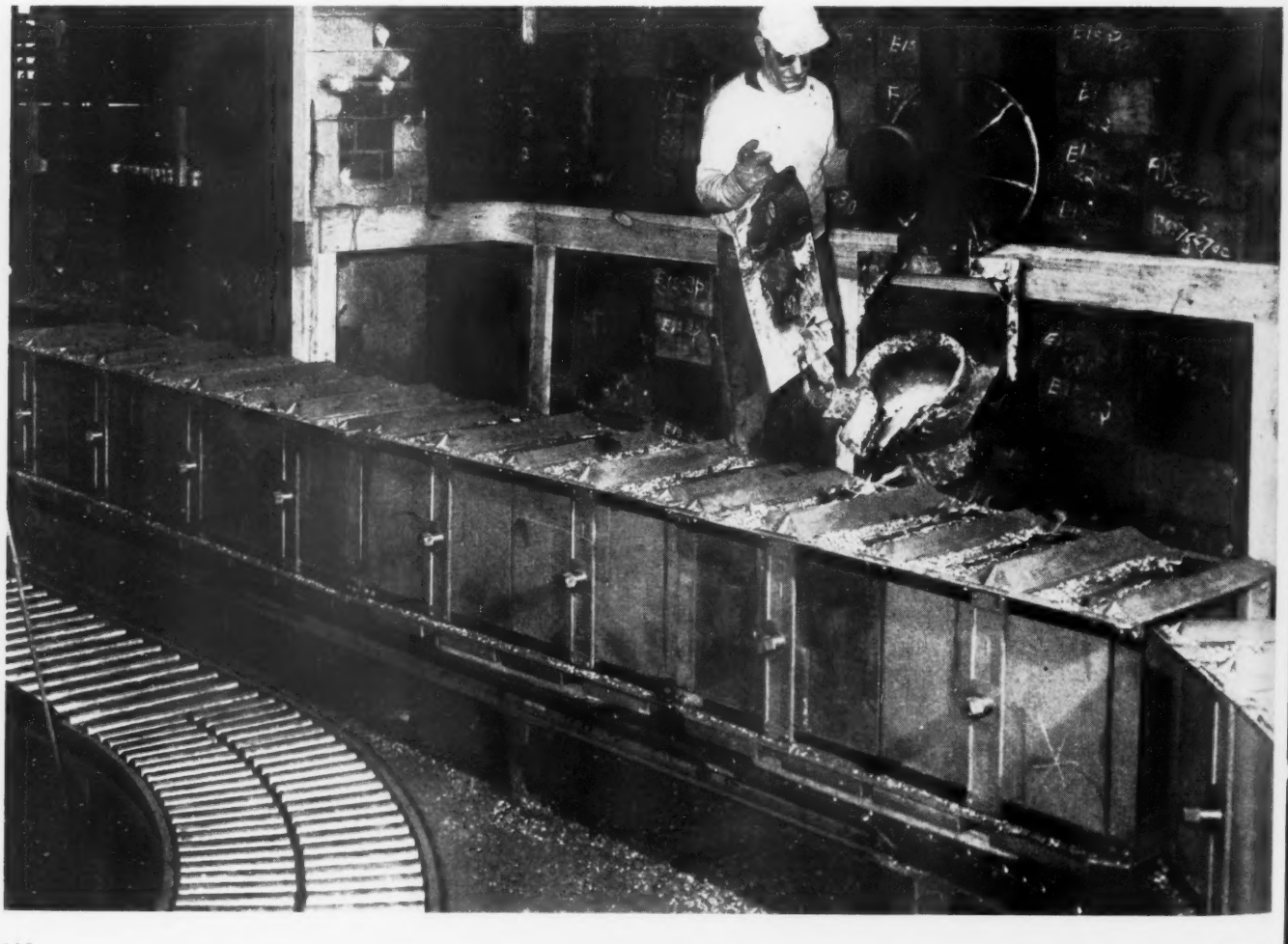
Because our back-up technique is neither time-consuming nor costly, we feel that it is good practice to back up all of our shell molds. Our pouring boxes are designed so as to hold four shell molds (Fig. 2). These boxes are moved along roller conveyors, so as to provide maximum flexibility of operation. First the shells are placed in a box, with the pouring basins covered with sheet metal guards. Then the box is moved under the gravel hopper, where the operator releases gravel from the hopper, with a deflector equalizing the fill. The box then moves along the conveyor, and the following box is filled.

Along the conveyor is an area where about four boxes can accumulate before entering the pouring zone. At this point the special features of our pouring boxes come into action. Here the gravel is clamped tightly against the back of the shells (Fig. 3). This eliminates casting finning, which is both costly to remove and loses casting tolerance across the parting line. Also along this line, the sheet metal guards are lifted off the pouring basins, and they are ready to pour.

Just ahead is a 90-degree curve in the conveyor line, which brings us into the pouring zone (Fig. 4). This area is serviced by a short monorail, which, through a switch, reaches the front of our mixing ladle. There is sufficient room to pour three boxes, or 12 shell molds, at one setting. Our average shell will take 15 to 20 lb of iron, so a 250-lb capacity pouring ladle is used.

Following the pouring zone is a section of about

Fig. 4—Pouring zone in the shell molding foundry



120 feet of conveyor, to provide cooling time. Even at maximum prduction of 3000 shells per eight-hour shift, this 120 feet allows 12 to 15 minutes for the shells to remain in the boxes. This conveyor is formed of two parallel sections, saving floor space. There is sufficient room between the two sections for a man to move and work. A transfer car at the end of both sections provides the means of getting the filled boxes started toward shakeout.

At the shakeout station, the box moves into a rockover unit. Here, a five-foot section of the conveyor is activated by an air cylinder. This section has a built-up framework on the sides and across the top, which retains the pouring box as the entire contents are discharged. The box rolls into the section against a retractable stop. This positions it centrally in this 5-ft section. Shifting a valve rotates this section toward a pit (Fig. 5). In this pit is resting a 22.5-cu-ft skip hoist bucket. This bucket has sufficient capacity for the entire contents of two pouring boxes. Reversing the valve raises this unit back to horizontal position, where the retractable stop is released and the empty box moved ahead into a second transfer car. It was at this point that

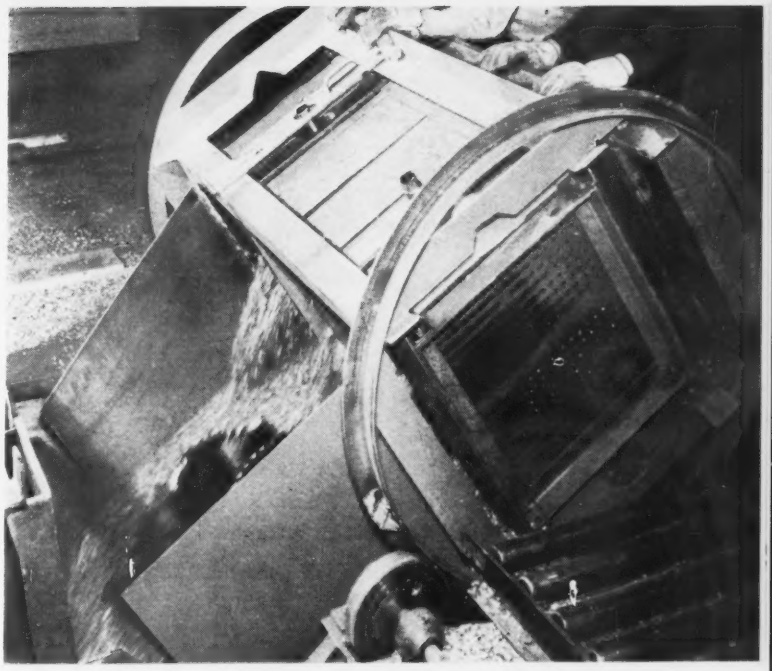
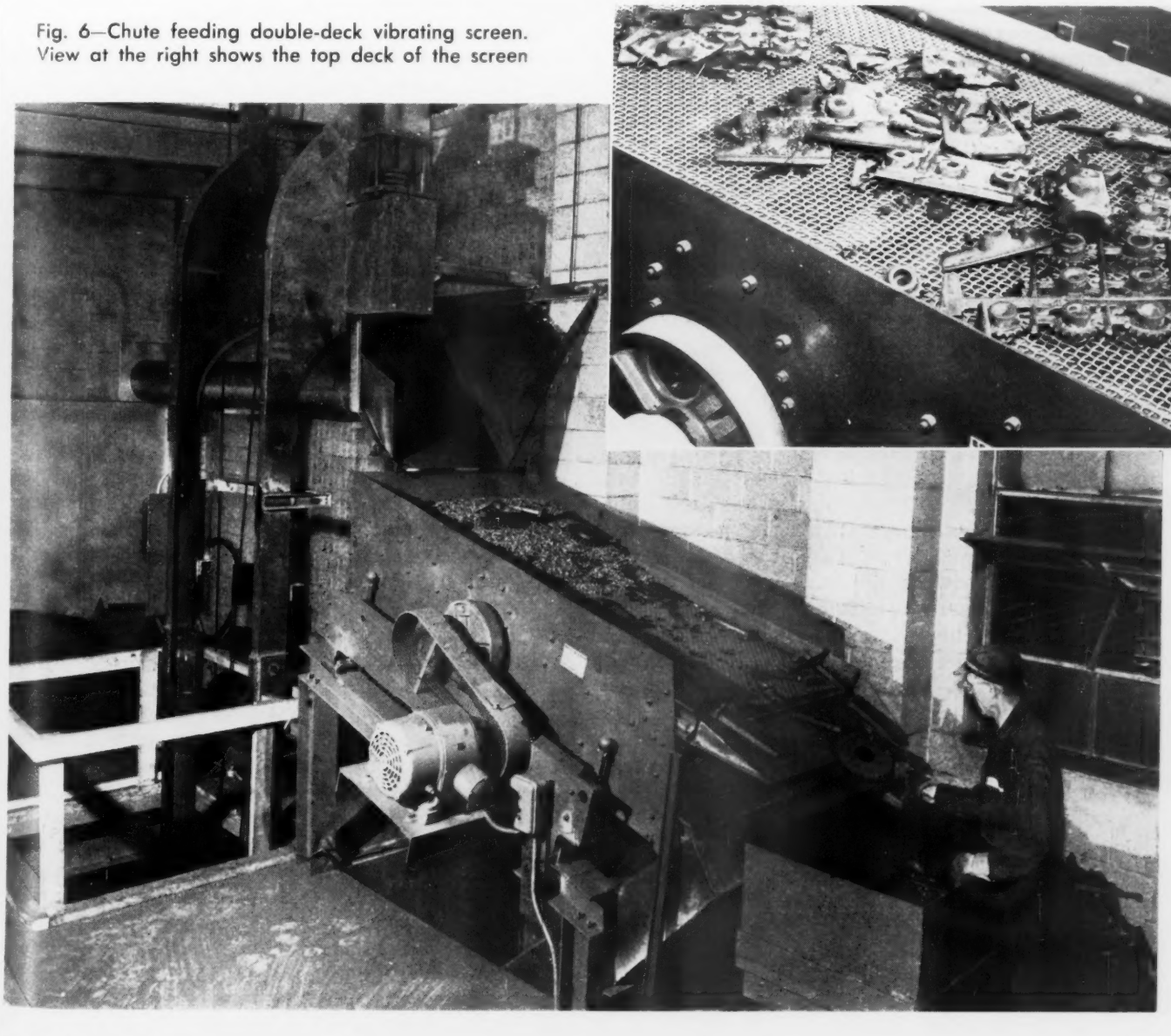
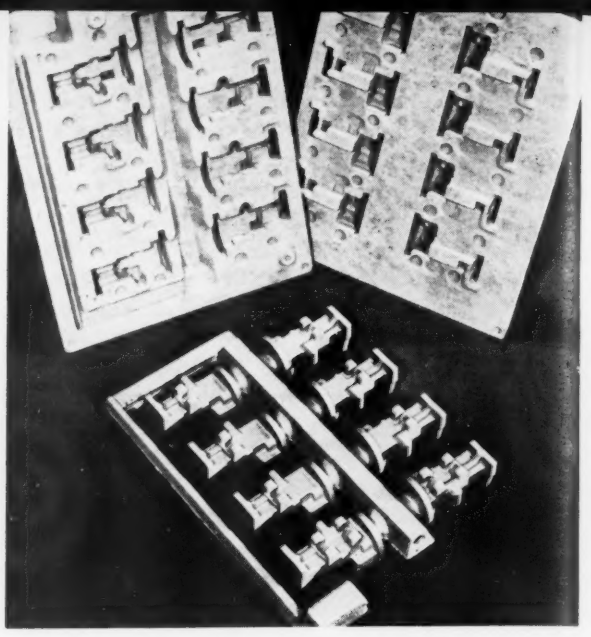


Fig. 5—Dumping the contents of a pouring box into a skip hoist bucket. This bucket has sufficient capacity to hold the molds and gravel of two boxes

Fig. 6—Chute feeding double-deck vibrating screen. View at the right shows the top deck of the screen



Proper storage of shell patterns prevents damage



Gate of castings and shells from which it is made

we first placed our shells into the boxes before moving under the gravel hopper.

After two boxes have been dumped into the skip bucket, pushing a button causes the skip hoist to go through its cycle. This raises the bucket and contents up through the second floor, where it empties into a chute about 9 feet above second floor level. Then, of course, the empty bucket returns to its position in the pit, where this operation is repeated.

This chute absorbs the impact of about 1300 lb of gravel, shells and gates of castings. It feeds toward the top end of a sloping double-decked vibrating screen (Fig. 6). The upper deck of this unit consists of a heavy ½-in. meshed screen. The lower end of this deck discharges the large pieces of shell, castings and gates. Most of the castings are sprued by the dumping and vibrating action of the screen. The vibrating screen is adjacent to the side wall of the new building. Just clearing the bottom edge of the top deck of the screen is a sloping steel table.

The operator deflects the broken pieces of shell toward the wall, where they fall into a chute through the wall into an accumulation hopper outside the building. Castings easily slide from this table into steel containers, while gates are directed into another chute, which leads also to the outside. This outside area is where our charges are made up for the cupola, so there is no handling problem on the returns.

The second, or lower, deck of the screen consists of heavy ⅛-in. mesh screening. Off the lower end of this deck falls the back-up gravel, where it feeds directly into the gravel hopper. This hopper, as was mentioned earlier, is located over the end of the conveyor at the filling point of the pouring boxes. A steep sloping collecting chute under the lower deck directs all the fine burnt sand out through the building wall into the previously mentioned accumulation hopper. The fines and broken pieces of shell are trucked from this accumulation hopper to our dumping area, about ¼-mile away.

Our casting containers consist of a castered cart, with the top edge about waist-high, for convenient usage. The bin area in the top is about 16 in. deep, and the carts will handle from 800 to 1200 lb of castings, depending upon bulk. These carts have swivel casters on all four legs, making them very maneuverable. The castings remain in the carts until they are sufficiently cool to process; and through the cleaning and grinding operations, they are transferred from one cart to another.

We have found that the grit used in our cleaning equipment for sand castings has a very definite abrasive action on the smooth surface of a shell casting. A fine shot or sand blast seems to provide a uniform good quality finish. Some of the newer abrasive belt machines lend themselves to the snagging of shell castings. More care is required than is the case with sand castings, because excess grinding detracts from the appearance of the casting, and may easily cut below the machining allowance, where the gate is on a machined surface. This last problem is much more critical on shell castings, because we are allowing for very little stock removal, such as .030-in.

In many cases, shell castings lend themselves to the use of simple, inexpensive snagging fixtures, which make work easier and quicker for the snagger, and help prevent scrap due to excess grinding. We like to grind castings before cleaning, to provide a uniform appearance when we ship them to our customers.

In our operation, we make use of existing sand foundry facilities and manpower. These include charging and cupola operators, shipping, maintenance, and office staff. At the present time, we are continuing to use conventional blown cores made in our present coreroom. In a shell molding operation, such as we have described, the following personnel of 26 persons, in addition to the services listed above, should be adequate:

One sand mixer, three shell machine operators, one core setter, one shell setter and mover, one gravel filler, three pourers, three laborers, one mechanic, one skip bucket operator, one shakeout screen operator, six snagging and cleaning, two inspectors, two supervisors.

It's Harder To Be Safe

In Jobbing Shop Operations

By EUGENE FRY
Metallurgist
Acme Foundry & Machine Co.
Coffeyville, Kans.

Certain operating conditions in the jobbing foundry make them particularly susceptible to accidents. The author discusses the principal potential hazards and offers suggestions for overcoming their danger

FOUNDRIES fashion parts for machinery used everywhere, but the equipment ordinarily is used in routine tasks, with seldom a thought to the hazards associated with its transformation from raw materials to finished product. Handling molten metals and heavy materials of many kinds requires the utmost in safety precautions, but the foundry industry as a whole, with a higher accident frequency rate than those of more than 30 other basic industries, has ample room for improvement.

Although top safety is never easy to maintain, it is much less of a problem in production shops than in jobbing foundries. Large or small, the latter differ from production-line plants in their manner of operation. Whereas production shops usually specialize, so that their patterns enjoy a long cycle of mold duplication, jobbing shops often get an order for a few castings or even for only one casting from a pattern. With a new pattern from which hundreds of castings are to be produced, a production foundry can afford to experiment to insure that high output is coupled with maximum safeguards for workers. Where some danger appears, it can be eliminated from the next shift, for the pattern is used over and over again.

Flirting with Safety—On the other hand, jobbing foundries sometimes bend safety standards to accommodate a job that is beyond the safe capacity of available physical equipment. Eager to land a new pattern, they may tend to overextend themselves. They may stretch their cranes or their ladle limits in order to do the *big* job, thereby contributing to an accident.

The jobbing foundry which attempts to complete a mold that requires more metal than is normally carried in its largest ladle faces a dangerous problem. For various reasons, including the fact that the plant's two overhead cranes cannot operate close enough together to permit double pouring, this particular mold may have to be poured singly. To perform this feat, the usual tolerance of metal line below the top of the ladle must be ignored and the refractory container filled to the very brim. But if the carrying vehicle is overtaxed, the resultant overflow and splashing of metal as the ladle is transported endangers workers in its fiery path.

Obviously the jobbing foundry which receives an order for one casting cannot economically run a few samples in advance to smooth out the safety "bugs." But during the rush to take advantage of this order, the correct routine still must be thought out in advance for efficiency and safety. Every day, almost every hour, supervisors and workers in the jobbing foundry are called upon to make instant decisions involving the safety of men participating in the work on a "must" casting. If the proposed undertaking does not come within the bounds of previous experience, then safety all too often may be in jeopardy.

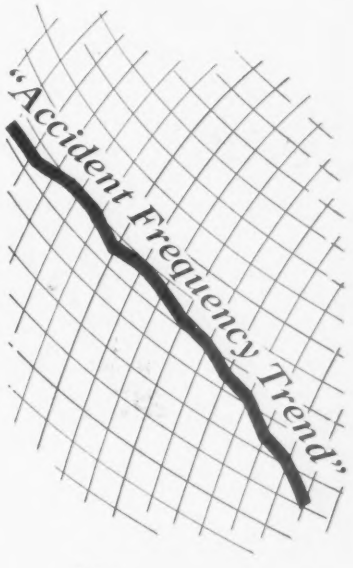
To achieve safety requires constant vigilance. Its proper follow-through means more than posting slogans at designated spots throughout the plant or holding regularly scheduled safety meetings. True, these activities are important and help to keep the personnel safety-conscious; but the over-all program demands much more.

To begin, top management should consider the safety factors first when contemplating the production of a rush order. The (*Please turn to page* 277)

"Safety Requires Constant Vigilance"

"Never Overload"

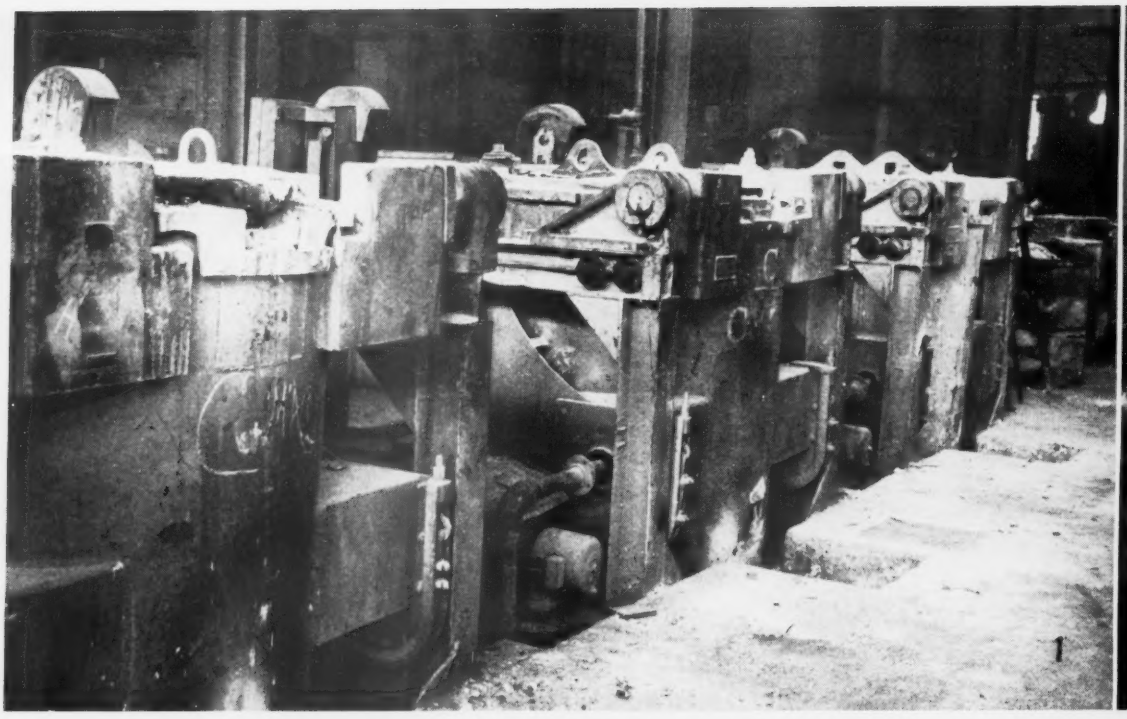
"Keep Equipment in Top Condition"



"Don't Flirt With Safety"

"Schedule Safety Meetings"

"Keep Personnel Safety Conscious"



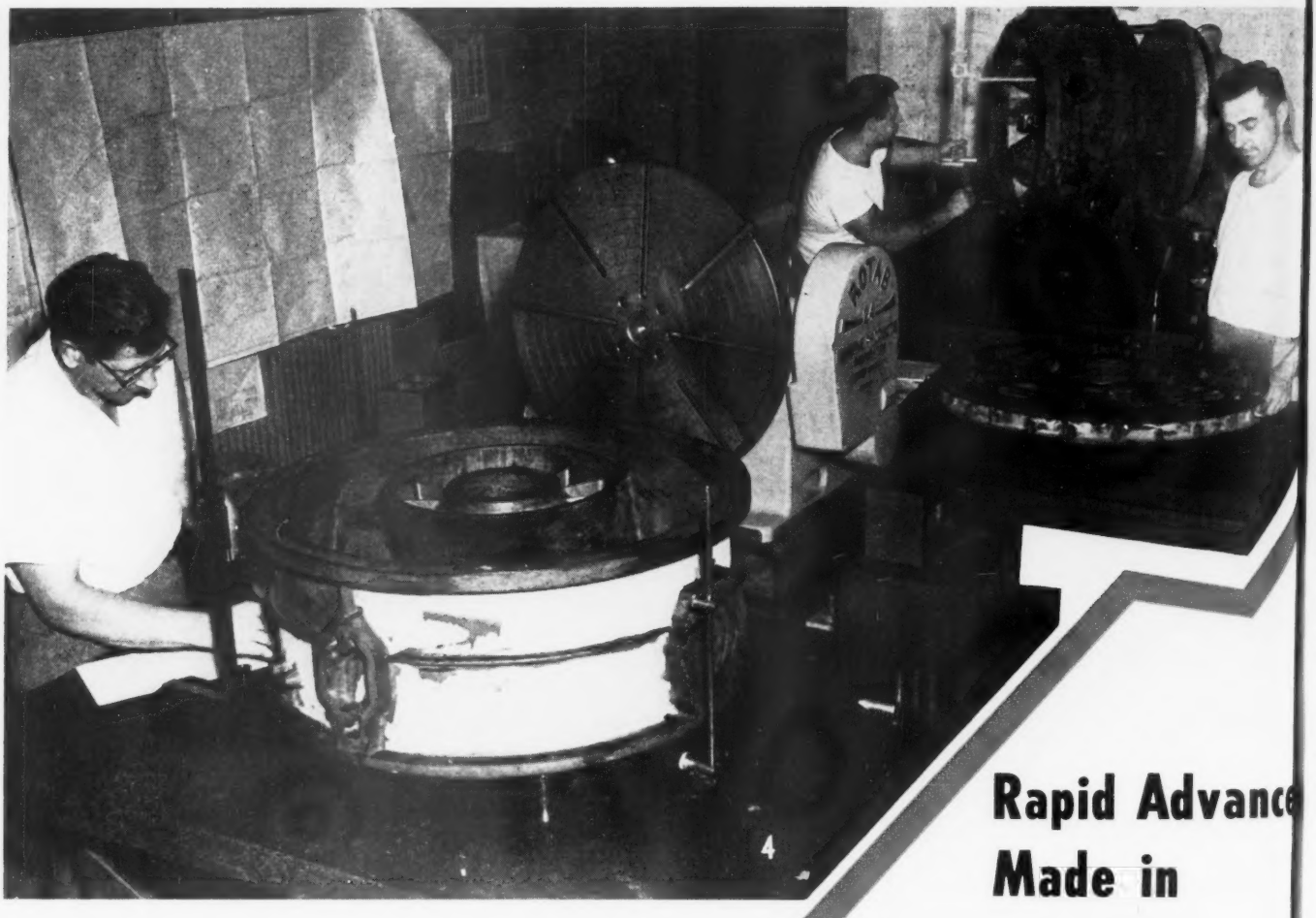


Fig. 1—Magnesium is melted in battery of 11 gas-fired tilting furnaces at foundry of Rolle Mfg. Co., Lansdale, Pa. Furnaces are of various capacities, averaging 1500 lb. Fig. 2—General view of dielectric oven for baking cores. Fig. 3—Load of magnesium castings being withdrawn from an electric heat treating furnace. Fig. 4—Layout room

Rapid Advance Made in

CASTINGS

By JOHN HOWE HALL, *Consultant*

LIGHT-METAL ALLOYS

A VISIT to the plant of the Rolle Mfg. Co., Lansdale, Pa., gives a vivid impression of the rapid advances that are being made in the manufacture of aluminum and magnesium alloy castings. In fact, in its advertising literature, this progressive concern refers to the light alloy casting industry as "The Magnificent Prodigy," and its products as "baby giants wearing trousers that are white, three-cornered and fastened with safety pins." Though the present author recalls that his grandchildren wear their trousers "pinned square" in the modern style, the metaphor is well chosen.

To a steel foundryman, the most striking achievement of the makers of light metal castings is the extraordinarily close control of section thicknesses and over-all dimensions that they have attained. In pieces up to 2 feet in diameter rough castings are regularly produced with a variation of only plus or minus 0.030-in. in both section thicknesses and over-all dimensions. When the maximum dimension is over 2 ft, the tolerance is raised to 0.060-in. This accuracy, moreover, is attained not only in parts produced in permanent molds, but in those poured in green sand molds and in core assemblies. A large proportion of Rolle's output, in fact, is produced by regular foundry methods, without resort to precision casting or shell molding processes.

The fact that such a high order of accuracy is attainable is due in part to the low temperature at which the light alloys are poured, and to their low specific gravity. The sand molds are affected by the heat of the metal far less than is the case with iron or steel, so that their dimensional accuracy is but little altered when they are filled with molten metal.

The low specific gravity of the alloys has a similar tendency; weighing approximately one quarter as much as steel, magnesium exerts a metallo-static pressure on the molds correspondingly lower than the ferro-static pressure of liquid steel, and the momentum of the flowing metal is similarly less. The tendency to produce swells in the sand is therefore reduced to a minimum. In fact, the sand of the molds is so little affected by the liquid metal that in order to permit cores and included portions of the sand molds to collapse readily and thus avoid the formation of tears in the castings, the strength of the sand mixtures is kept very low.

Obviously, however, the dimensions of the molds

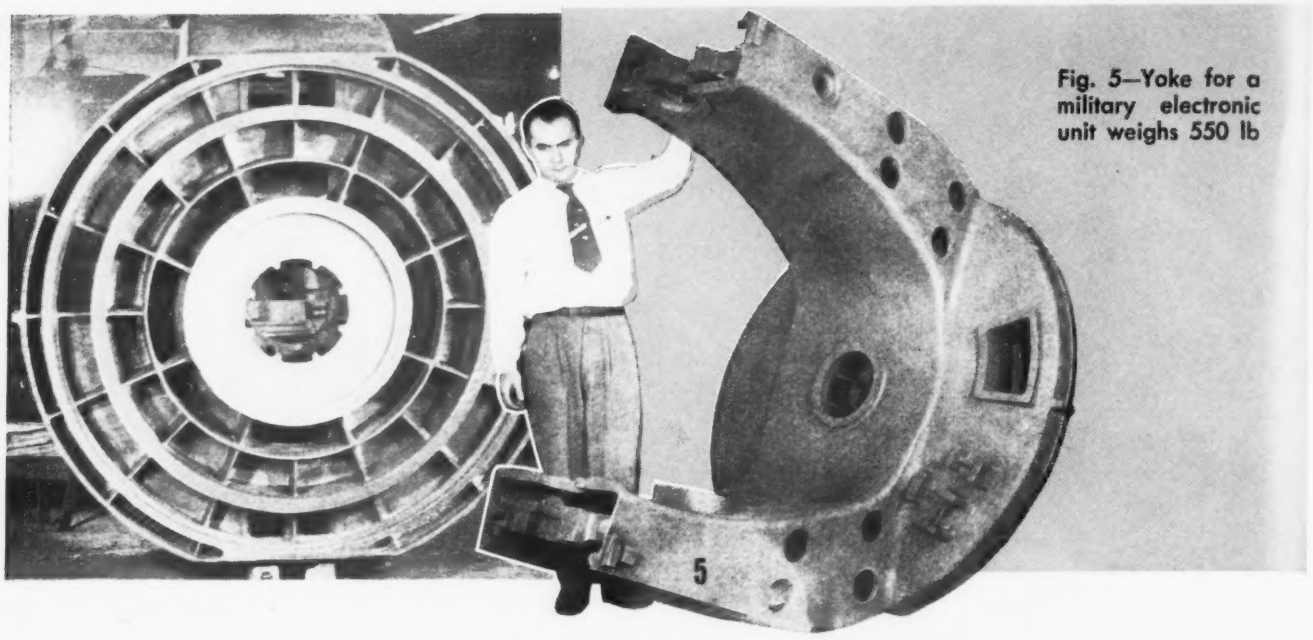
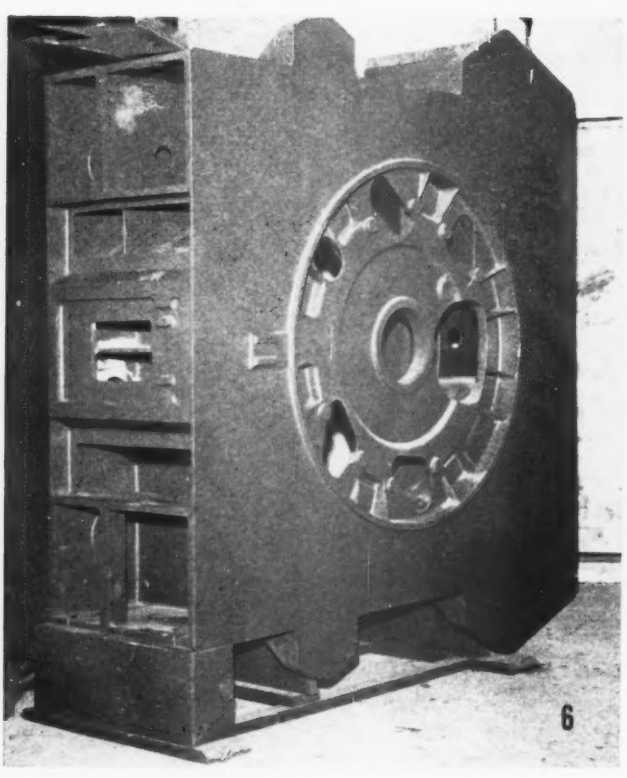
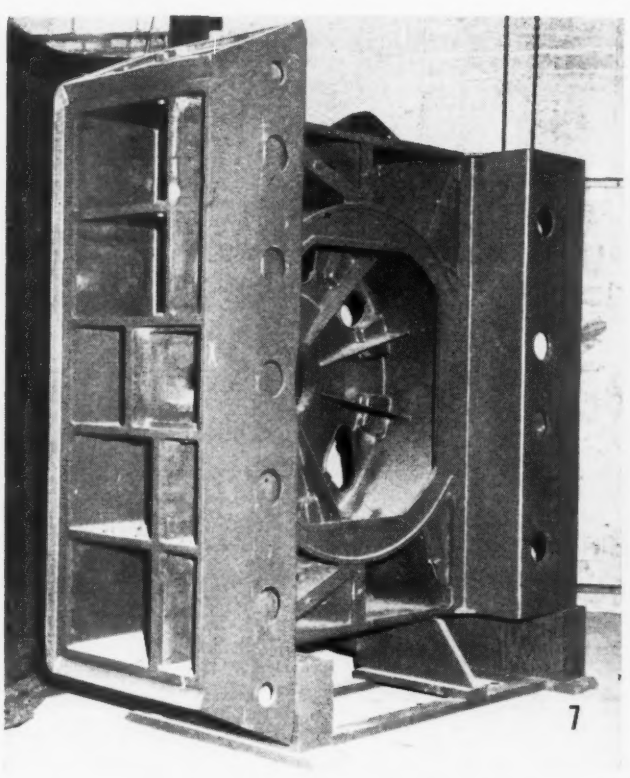
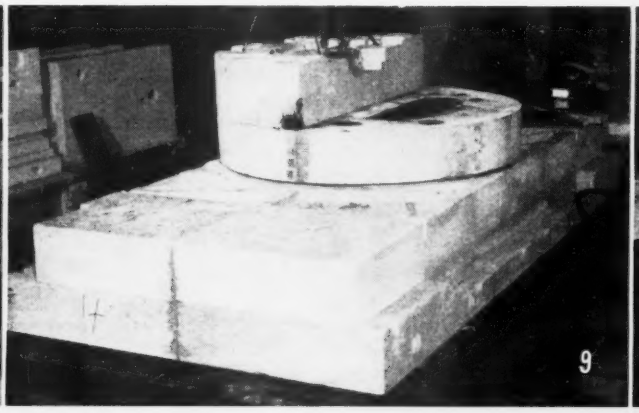


Fig. 5—Yoke for a military electronic unit weighs 550 lb





Figs. 6-7—Front and back views of cast magnesium base for yoke shown in Fig. 5. Unusually large for a magnesium casting, this part weighs 1630 lb and was cast in a mold assembly made up of 197 cores



must be held to the same degree of accuracy that is required in the castings. Patterns and coreboxes, therefore, must be unusually accurate in dimensions; complicated cores are turned out and dried in well built drying racks, and the dimensions of molds and cores are constantly checked by means of elaborate gages and templates. The setting of cores in green sand molds is similarly controlled by means of jigs and elaborate fixtures that make it possible to attain the necessary dimensional accuracy.

In many cases, complete core assemblies are used instead of rammed molds, and similar means are employed to insure accurate setting of the cores that make up the mold. Several highly skilled men on each shift oversee the gaging of molds and the setting of cores. These men handle each new job in the shop until the molding machine operators and closing gangs are able to take it over.

All-synthetic sand mixtures are used, the base sand being washed and dried south Jersey silica sands of about 60-70 mesh. For certain jobs, such as cylinder heads with their thin, closely spaced cooling fins, oil sands are used, but for the majority of the mixtures, synthetic resin binders are preferred. To promote ready collapsibility, the moisture in the core sands is held to a very low figure. Sand is prepared in mechanical mixers, and the properties of the batches are checked regularly in a well equipped sand testing laboratory, this including determination of gas content and rate of gas evolution.

In connection with an extensive program of enlarging the foundry and relocating the equipment, an up-to-date sand reclamation and distribution system currently is being installed to handle all the sand used in the foundry and corerooms.

As is necessary in all plants handling molten magnesium, an inhibitor is mixed in the sand used for the magnesium alloys. The function of this material is to evolve gas as soon as the metal strikes the sand, so that the mold cavity is at once filled with a non-oxidizing vapor and air is excluded. In this way the chances for the metal to catch fire are reduced to a minimum.

The several different sand mixtures are also distinguished by means of dyes, so that there is but little chance of the wrong sand being used for any particular job and especially to prevent sand not containing inhibitors from coming in contact with molten magnesium. Wherever molten magnesium is handled, too, powder extinguishers are at hand in case of emergency.

Small green sand molds are made on a battery of nine jolt-squeezers, the larger ones on five jolt rollovers used for drags, five pin-lift jolters for copes, and one plain jolter for odd jobs. From the jolters the drags are run out on roller conveyors, to be carefully gaged, cored up and closed. The coreroom is also adequately equipped with mechanical equipment, including a rollover and draw machine of modern design for handling the larger cores.

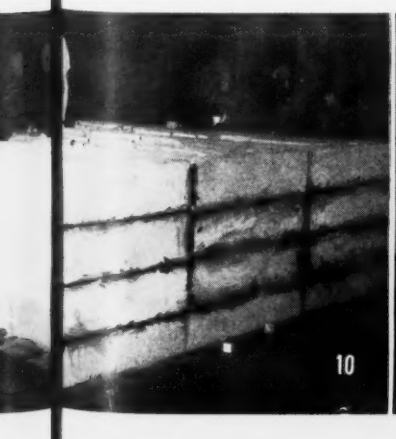
Some of the green sand molds are skin dried, but the majority are poured after only the usual air drying. Cores are dried either in an externally fired oven, or in a high-frequency dielectric oven about 18 ft long. Fig. 2 is an over-all view of the installation. A much larger dielectric oven, 54 ft long, is now being set up, to supplement the existing equipment. This is said to be the largest unit of this type so far installed in any foundry.

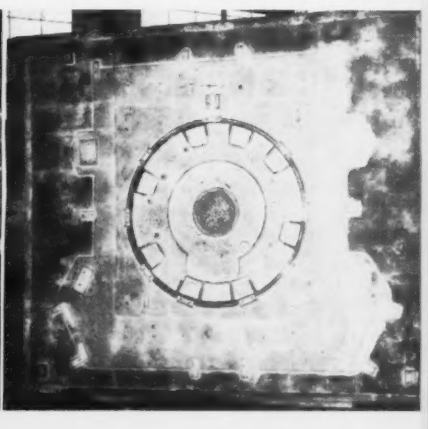
The metal is melted in a battery of eleven gas-fired tilting furnaces, shown in Fig. 1. These are of various capacities, averaging 1500 lb. The pots used in them to hold the metal are of heavy alloy steel plate, made in three sections and joined together by welding. From these larger furnaces, the melted metal is transferred to smaller pots, set in refining and superheating furnaces, of which there are 28. Here the metal temperature is brought to the desired point, and chlorine is bubbled through the melts to eliminate gases held in solution.

In both the melting and the refining furnaces, the temperature of the metal is accurately measured with immersion thermocouples, and a further check is made as the pots are withdrawn and carried to the pour-off station, from where they are wheeled on buggies to the pouring floor. For the very large castings, the pots are handled by an overhead crane.

Composition of the metal is accurately and quickly determined by means of an elaborate direct-reading Quantometer, installed in (*Please turn to page* 281)

Fig. 8—First two courses of cores for the base casting core assembly mold. Fig. 9—Some of the cores for the third and fourth courses being set. Fig. 10—Here the core assembly is nearly complete. Fig. 11—Flask in place ready for cope. Fig. 12—Cope pattern plate. Molding sand is used for cope

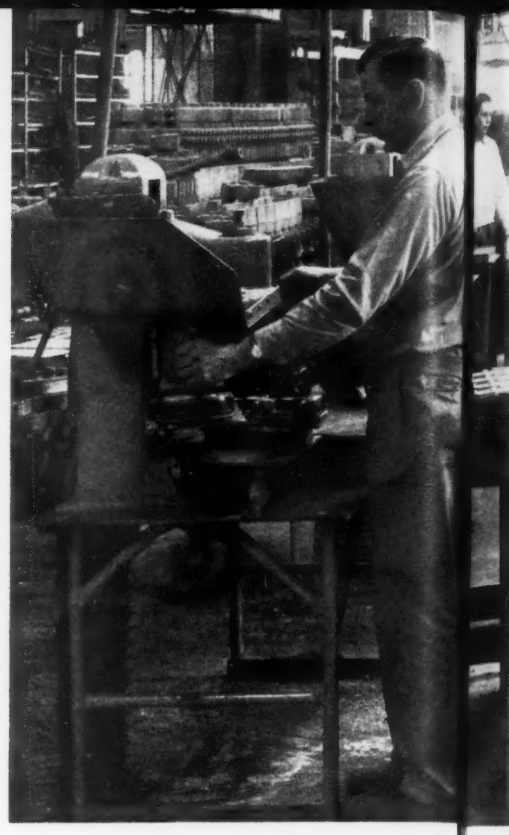




NEW COREROOM

Handles Jobbing Work Efficiently

By JOHN E. WOLF
Midwest Foundry Co.
Coldwater, Mich.



IN MANY jobbing foundries, although modern and efficient in every respect, the coreroom has tended to be a bottleneck. In almost every case when there is difficulty in setting up for a day's production, the coreroom seems to be one of the factors responsible. There are many reasons for this.

The trend in jobbing foundries, which are not fully mechanized, is toward more intricately cored work as the simpler work is more readily adaptable to mechanized lines, and the increased production facilitated by mechanical handling of molds on long running jobs makes it difficult for the nonmechanized foundries to compete. There are occasions also when production calls for a greater percentage of large cores than normal, thus putting a strain on available baking capacity. Then, too, there are times when cores requiring an abnormal amount of assembly, pasting, trimming and dipping are needed in greater quantity than usual. For these reasons and also because of a 20 per cent expansion in production facilities, it became necessary at Midwest Foundry Co. to build a larger and better equipped coreroom.

The new coreroom is laid out for simplicity as well as efficiency. Core blowers and benches are located on either side of a single, powered conveyor belt (Fig. 1) which carries the cores to the loading station of a vertical, continuous gas-fired core oven. Major coremaking equipment consists of core blowers and 1 bench blower. Approximately 90 per cent of all cores made are blown on these machines. Other nonproduction cores are made on benches also located within easy reach of the conveyor.

The coreroom normally operates 16 hours a day in two shifts. The first shift starts at 7 a.m., finishing at 3:30 p.m. with a half-hour for lunch; the second shift starts at 3:30 p.m. and finishes at 12:30 a.m. with a half-hour for lunch. In this period of time a total of 35 men on both shifts produces enough cores for production of 50 to 60 tons of gray iron poured in the foundry each day.

A large percentage of the castings made at Midwest are for the automotive, agricultural, display fixtures and compressor industries. The core equipment and finished cores for an automotive water connection elbow is shown in Fig. 3. This is a five-piece corebox. The center section is mounted on a brass plate held in place by the same pins that line up the cope half of the box. The center core is made in a separate box and partially baked. The cope half of the main core is blown, the box is rolled and sand is blown into the drag half. Then the brass plate is removed and the center core is inserted in the drag half of the core. Paste is applied (Fig. 5) and the assembly is booked together and placed in a dryer ready for baking. This core is produced at the rate of 40 to 50 an hour and each core produces two castings. This is typical of the many cores produced in large quantity at Midwest daily.

Mixing of the core sand is accomplished in two mixers. (Fig. 2) One type of sand mixture is used in all blowers with slight variations for certain jobs, while a different mixture is used for the bench jobs. A typical mixture of core blowing sand comprises: 185 lb silica sand (45 AFS fineness), 185 lb lake sand (60 AFS fineness), 4¾ lb cereal binder, 2 qt core oil, 1 pt kerosene, 3 qt water.

Mixed sand is delivered from the mixers to the core blowers and benches from the rear so there need be no interruption of core production during loading of hoppers on benches. While they are not yet installed, two 100-ton capacity silos located outside the building next to the wall at the north end of the building will be used for sand storage. Sand is to be loaded into these silos by means of bucket conveyors and supplied to the coreroom through openings into the coreroom. Silica sand will be stored in one silo and lake sand in the other.

The continuous tower oven (Fig. 4) is operated at a temperature of approximately 490° F with a 70-minute cycle. The greater (*Please turn to page* 221)

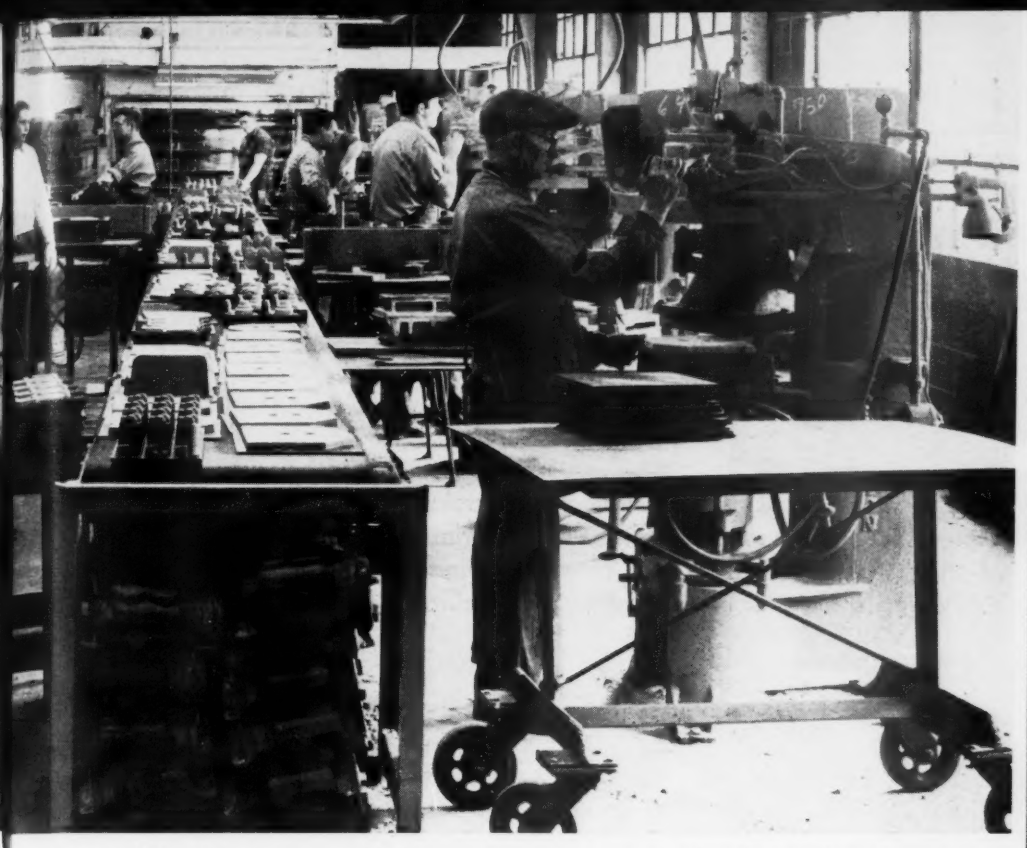


Fig. 1—This 55-foot, powered belt conveyor moves cores to loading station of oven

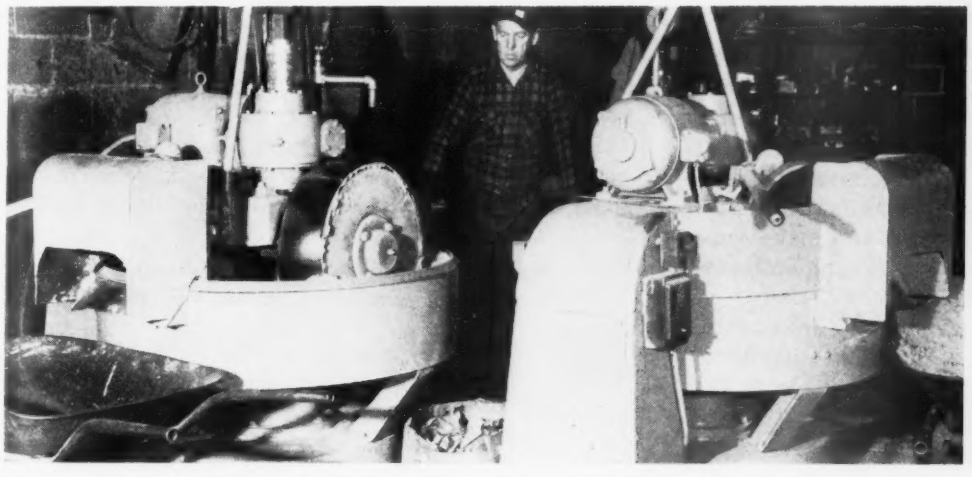


Fig. 2—Two mixers are used to prepare the core sand

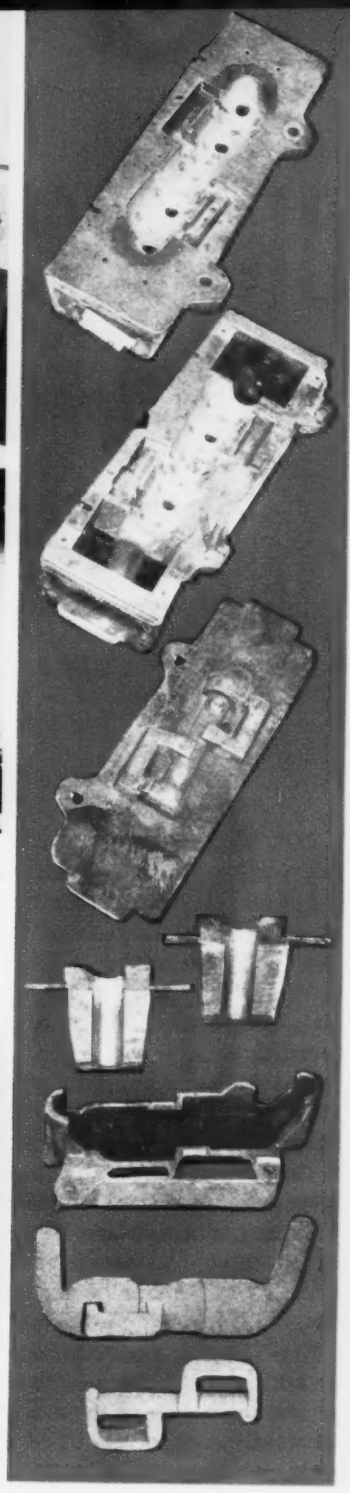


Fig. 3—Cores for automotive water connection elbow use five-piece box

Fig. 4—Cores being placed in continuous tower baking oven from loading station at end of the conveyor

Fig. 5—Coremaker applying paste to core for water connection elbow. Production is 40 to 50 an hour

CRACKS and HOT TEARS

In Steel Castings

In what he terms a second look at the subject of cracks and hot tears, the author reviews and re-evaluates results of previous investigations in the light of more recent studies. An attempt is made to correlate various data and bring some order from seemingly conflicting information

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HOT TEARS have finally moved off dead center, where they have been stuck for about ten years. The results of a number of important investigations published recently offer possible explanations for many past mysteries about hot tearing. These investigations make it necessary to review and re-evaluate previous theories in the light of this new knowledge.

This article comprises such a review. It may contain information that is unfamiliar to some readers, although published years ago. It may be of interest to those readers who are familiar with past work, that data extending back twenty years in many publications are collected and compared. Finally, the writer has attempted to correlate these data and make some sense from a mass of seemingly conflicting information.

It is finally possible to answer five fundamental questions regarding hot tearing, questions that must be answered before even a start can be made to understand this defect. The answers are contrary to prevalent thought in most steel foundries. However, there is enough proof that there can be little question as to the validity of the following:

1. Mechanism of Hot Tearing. Strain concentration in the last remaining liquid films between the solid dendrites of almost solid metal. This strain concentration can be microscopic, as just described, or of casting size as strain concentration in the last part of the casting to solidify.

2. Temperature of Hot Tearing. Very close to the solidus (end of freeze), not several hundred degrees below the solidus, as previously believed.

3. Contraction Required for Hot Tearing. Measured in thousandths of an inch, not with a 6-foot rule.

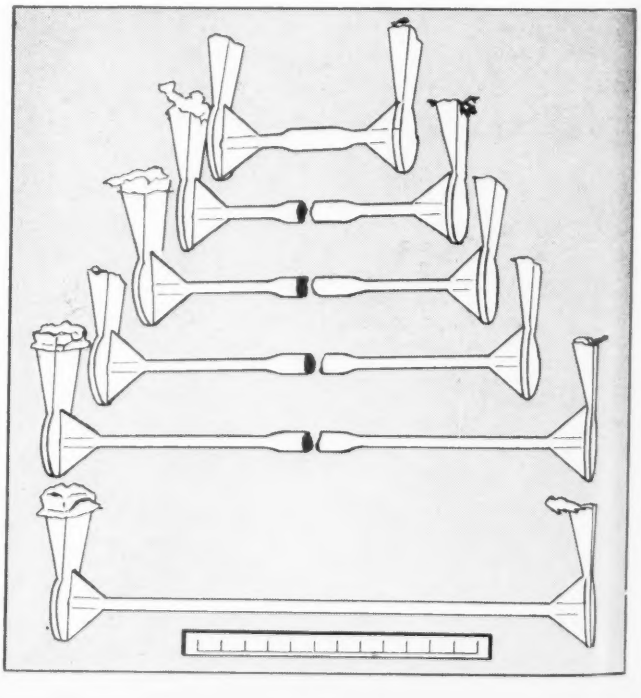
4. Stress Required for Hot Tearing. Very low, less than 50 psi. There is evidence that small hot tears form at practically zero stress.

5. Time of Hot Tearing. Can be less than one minute after the mold is filled for sections less than 1 in. Can be as much as 25 minutes after pouring for 8-in. sections.

The next point that must be clarified is the relative importance of the variables affecting hot tearing. It is quite probable that neglecting this order of importance is the major reason for the confusion in the past. If a minor variable is watched and controlled and major variables neglected, the confusion that will arise is self evident. Formal proof for the following order of importance is not complete, but evidence points to this sequence:

Strain Concentration—If strain concentration (dependent on amount of contraction and size of hot spot) does not exceed a critical value, about 0.00002

Fig. 1—Showing the effect of length of a contracting member on hot tearing. (Hall[3])



in./in./°F, hot tearing cannot occur.

Temperature Gradients—If the shape of the casting, or temperature gradients caused by gating and metal flow, do not cause hot spots that freeze less than 80 per cent (approximate) as fast as the rest of the casting, hot tearing cannot occur. The amount of hot tearing increases as temperature gradients and strain concentration increase above these critical minimum amounts. These two prime variables possibly measure a single more fundamental variable, rate of strain.

Chills—As chills affect the second variable, temperature gradients, their proper application can eliminate hot tearing. Their improper application can greatly increase hot tearing.

Gating, Risering, Sand—These three variables seem to fall next in importance to chills, strain concentration and temperature gradients. Not enough data are available to make any quantitative listing. Lack of these data is probably the reason for the confusion on metal variables.

Temperature, Composition, etc.—Metal variables, especially those available for control of hot tearing, seem to be relatively minor. It requires a gross favorable change of a number of metal variables to cause about the same improvement that can be gained by a similar change in just one of the more important variables.

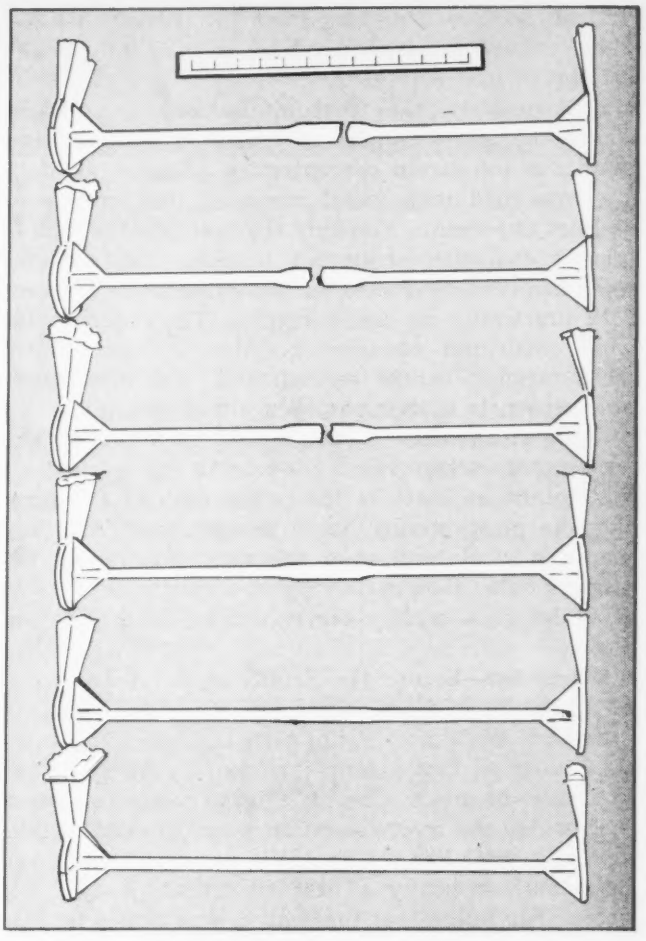
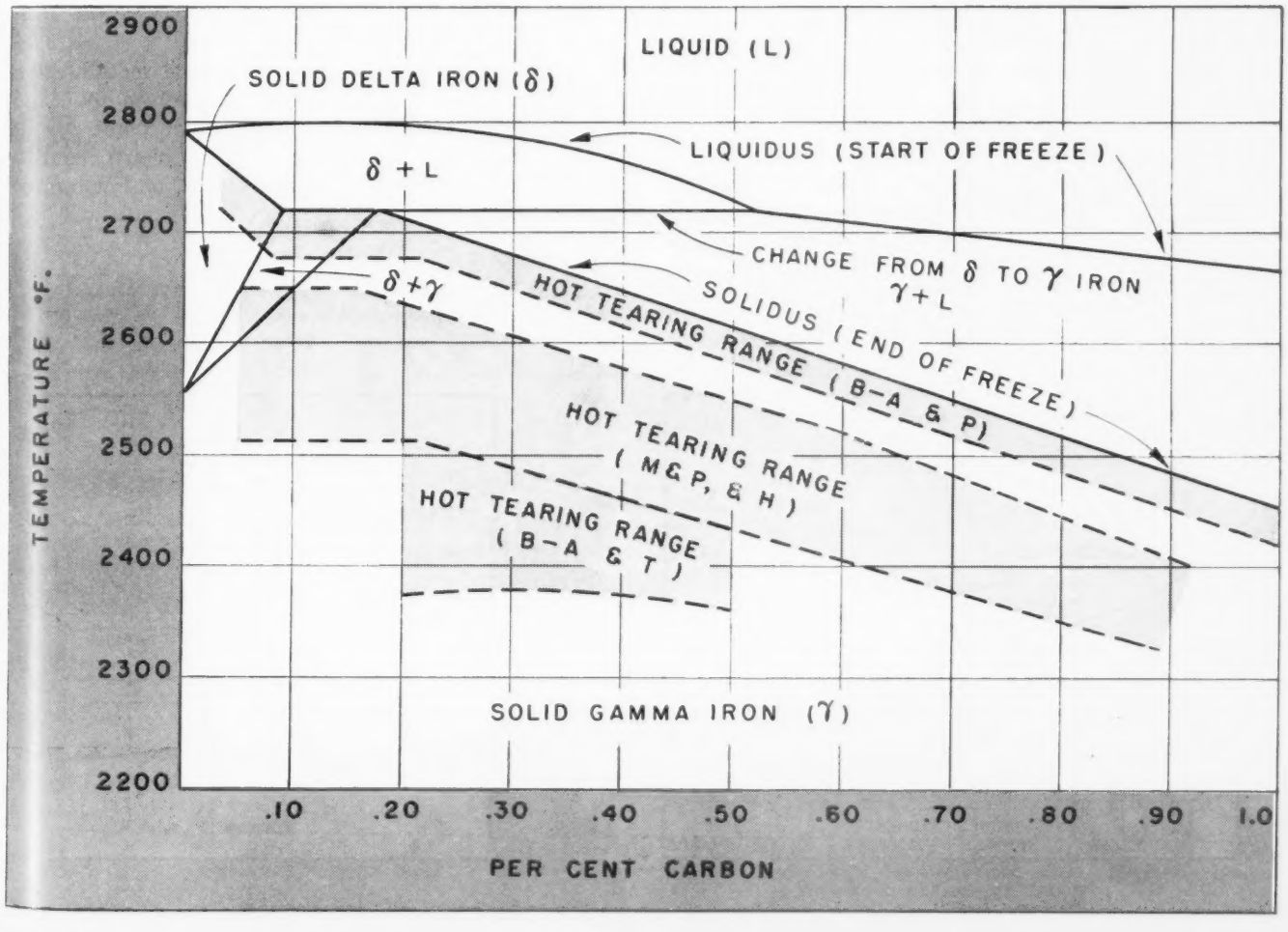


Fig. 2 (right)—Illlustrating effect of the diameter of hot spot on hot tearing (Hall[3])

Fig. 3—Summary of hot tearing temperatures



Mold Surface Friction, Dendritic Solidification—These are either minor variables, or their influence is not appreciated at present.

Unfortunately, the least information is available about the most important variables—temperature gradients and strain concentration. Almost all data are concerned with metal variables that appear to be least important. Probably the best proof of this is present confusion about hot tearing. Experimental work has been conducted on this subject for 20 years with practically no usable results. The experimental work, with the possible exception of temperature measurements, cannot be criticized. The most probable reason is that it has been aimed wrong.

Acknowledgment—As this article is a review, the writer must acknowledge his debt to the original investigators, as listed in the references. At the same time he must absolve these contributors from any blame in what may seem arbitrary juggling of the original data. He can only plead necessity in order to give the data some common denominator for comparison.

Discussion—Before the details of hot tearing can be discussed it seems necessary to devote space to a detailed discussion of the various types of ruptures that occur in cast steel. Confused terminology and improper diagnosis are still causing much confusion.

Probably the most important point to emphasize is that if a crack-like separation shows up after a given operation, especially a heat treatment, it does not necessarily follow that the rupture was caused by that operation. Many times a hot tear that formed within a minute or so after pouring does not become visible until days later, after final heat treatment. Invariably the heat treatment is blamed, whereas heat treatment's only role was in scaling and possibly opening up the hot tear and making it visible.

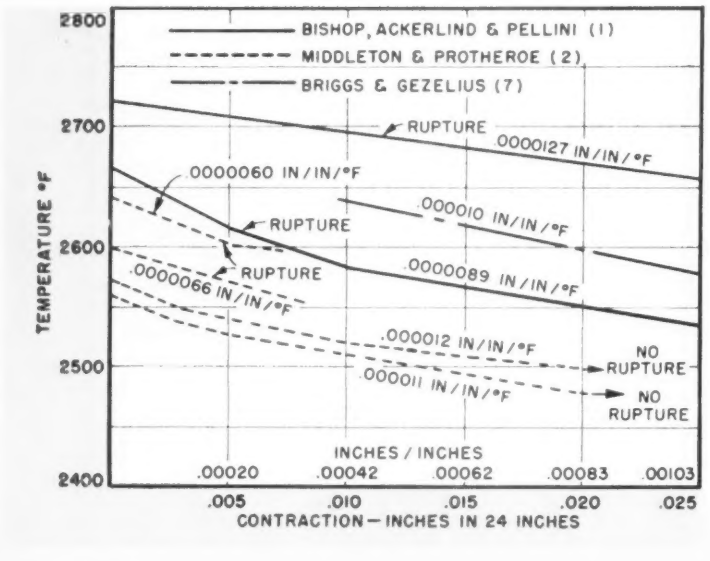
The futility of attempting to eliminate the hot tear during heat treatment is self evident. Therefore, it is important to differentiate between cooling cracks and hot tears. Hot tears can always be distinguished by their discontinuity. Even though the hot tear is wide open, the end of the tear will be discontinuous, consisting of a number of unconnected small ruptures, following a given path. Cooling cracks are always continuous and sharp to the very end. Very often the fracture of a cooling crack is shiny and the rupture must occur at or near room temperature. It is not unusual to crack through the center of a heavy section. Hot tears in the same casting usually are found at the junctions of the heavy section and connecting thinner sections.

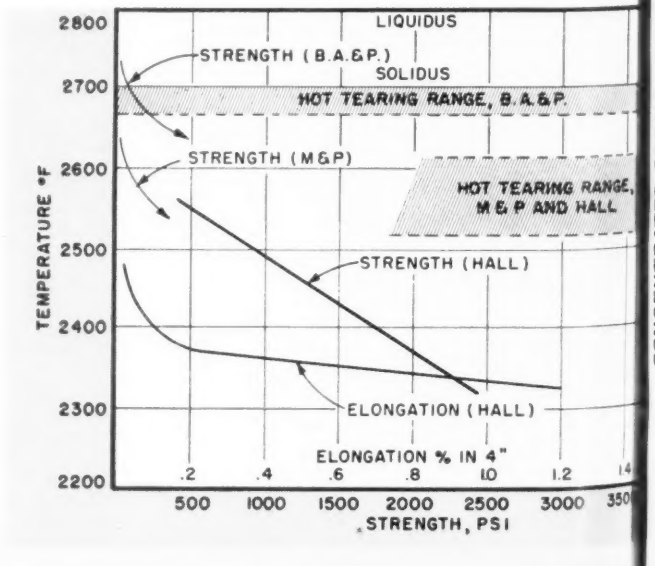
In general, cooling cracks are caused by unequal or too rapid cooling and are related to analysis and hardenability. A soft steel is relatively foolproof; one that hardens in air must be handled with kid gloves. If the stresses imposed on the casting by hindered contraction in the mold *below* the hot tearing temperature, plus unequal cooling on shakeout, plus stress setup by the gamma-alpha transformation exceed the strength of the metal, something has to give. If the casting can deform to relieve part of this stress, all well and good. If the casting is made of high-carbon, or alloy steel that hardens on shakeout, or is of such design and size that it cannot deform, the relieving of this internal stress can actually be explosive.

There are a number of cleaning room operations that involve unequal heating and cooling and can cause cooling cracks—flame cutting and scarfing, grinding, welding, heat treatment and just plain rough handling. The imposition of stress is additive. If the casting comes to the cleaning room highly stressed and is not stress relieved before these operations, any additional stress due to these operations may be the straw that breaks the casting's back.

All the causes of cooling cracks are metallurgical, have been investigated and can be solved by simple metallurgical methods. The important point for the foundryman is not to confuse these sharp, continuous cooling cracks with his discontinuous hot tears.

Fig. 4 (left)—Contraction through hot tearing range. Fig. 5 (right)—Summary of strength and elongation values vs temperature. This chart is a vertical section through Fig. 3, at 0.20 to 0.25 per cent carbon





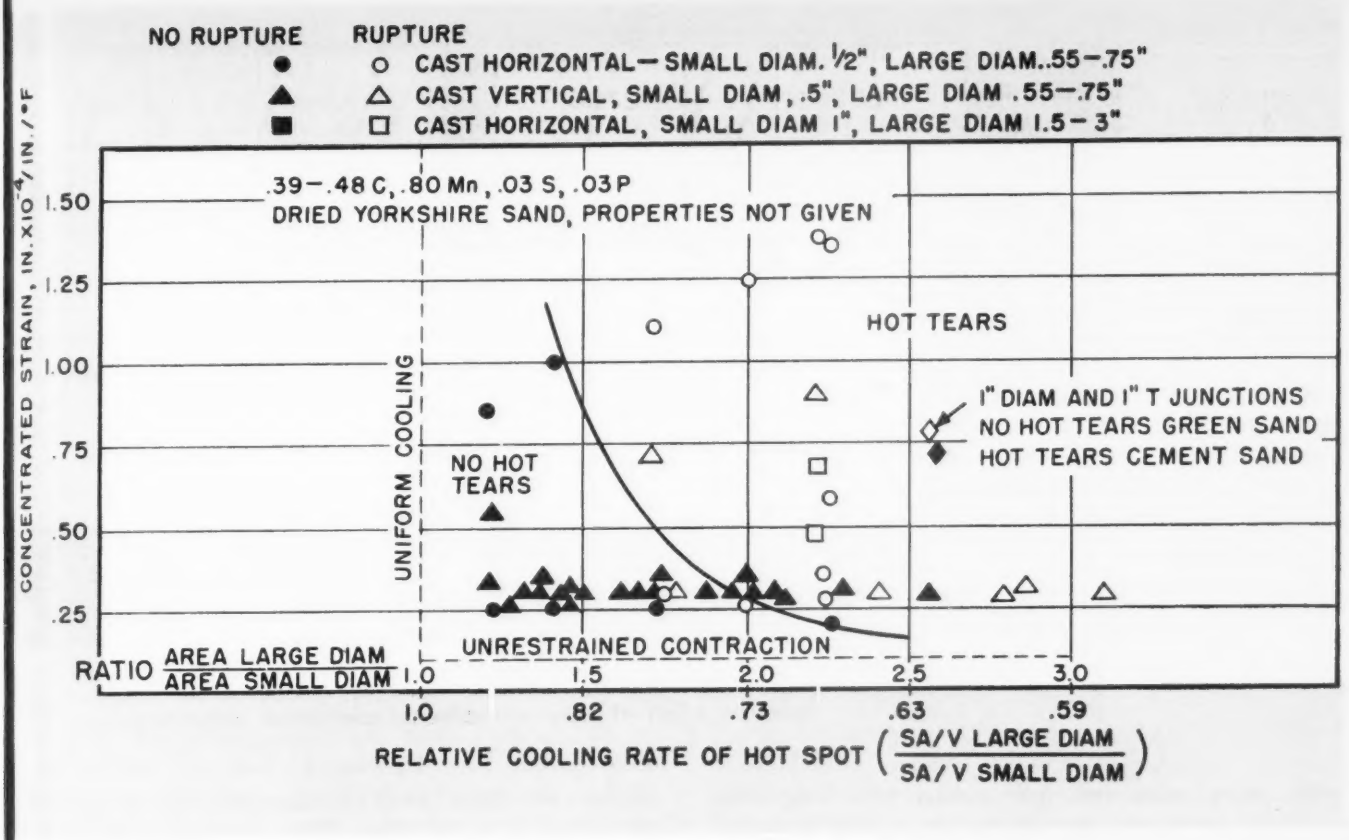
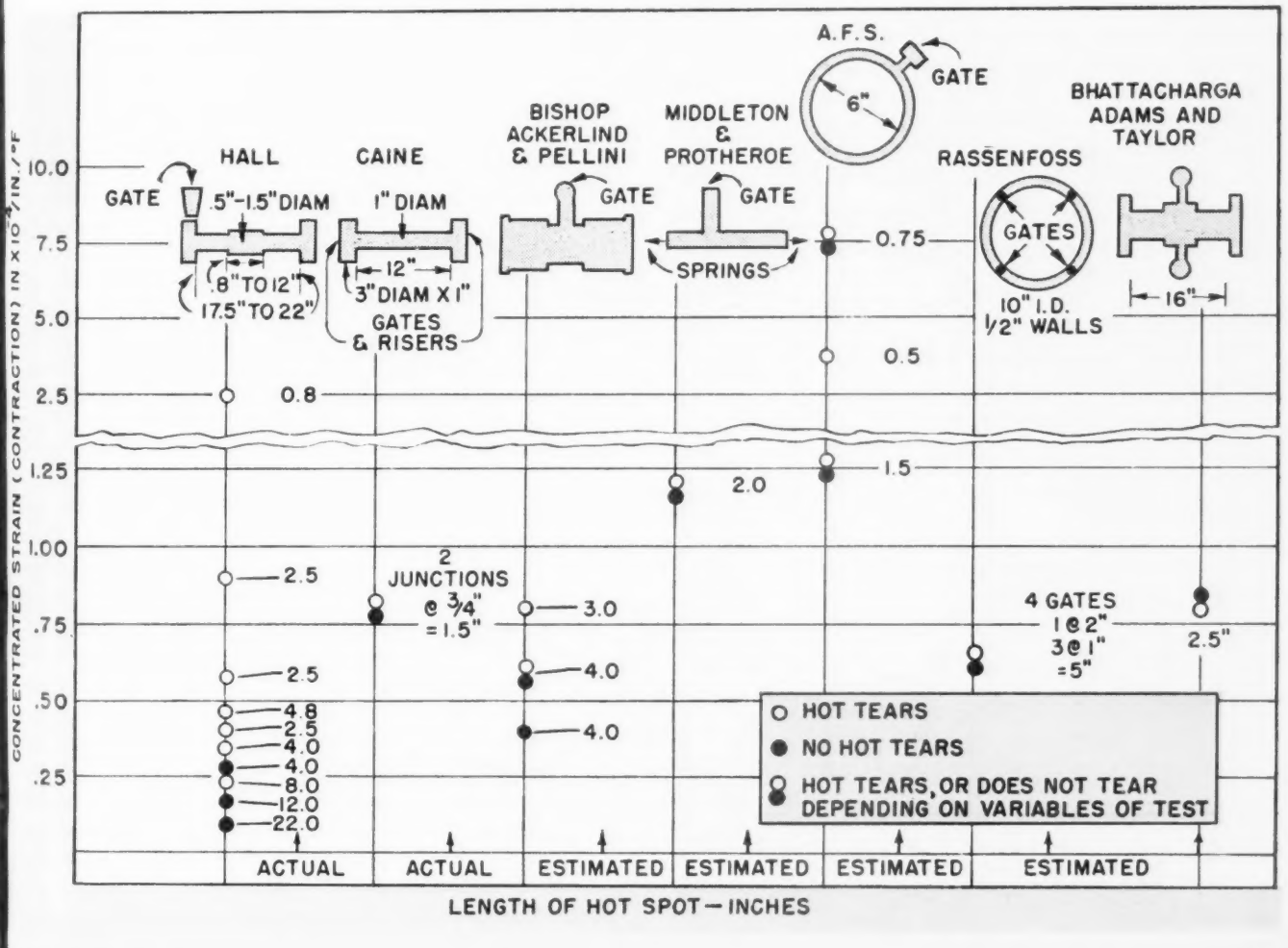
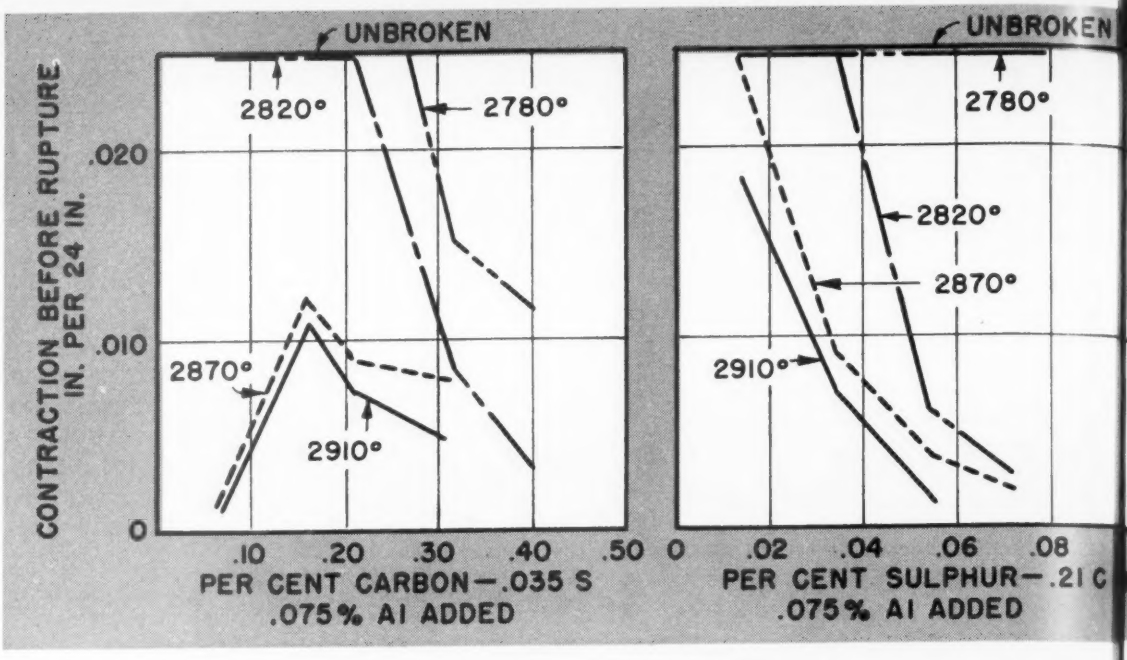


Fig. 6 (above)—Depicting first approximation of a relation between strain concentration, relative cooling rate, hot tearing.

Fig. 7 (below)—Strain concentration comparison in test castings

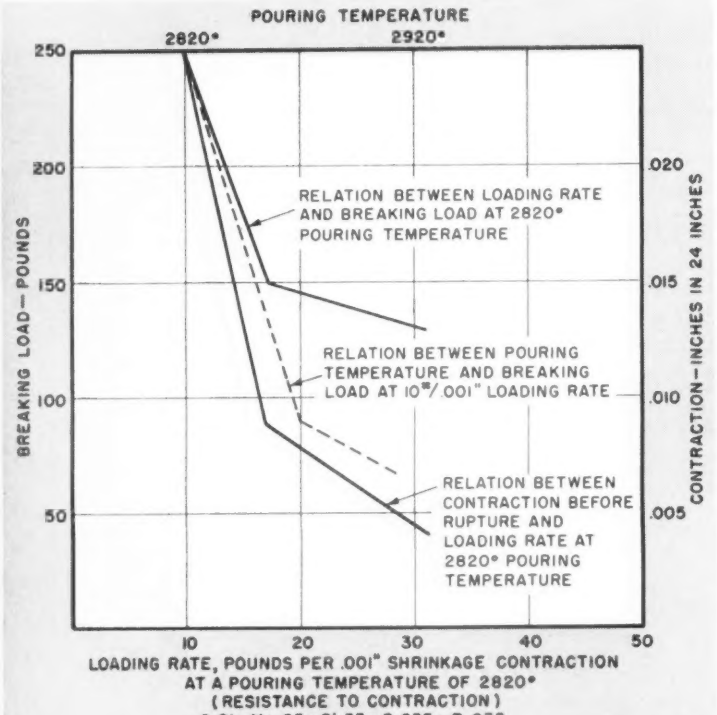




Figs. 9-13—Illustrating results of work by Middleton and Protheroe[2] on effect of metal variables on contraction before rupture

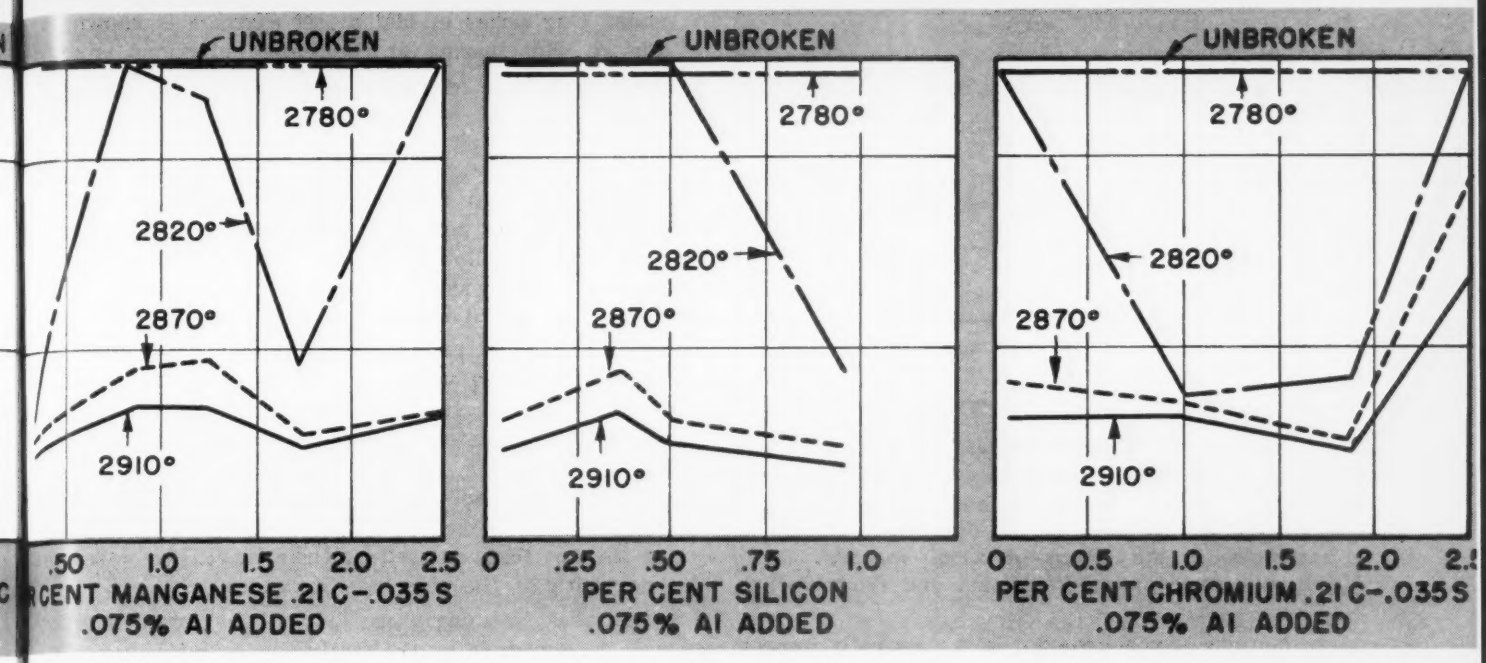
The very name hot tear means something—the metal has been torn apart by external force or strain while it consisted of both brittle and ductile phases. The surfaces of a hot tear are oxidized and show a coarse dendrite structure. This is consistent with Bishop, Ackerlind and Pellini's explanation of hot tearing mechanism. The metal ruptures in the weak brittle interdendritic fillings. The solidified dendrites have high plasticity and do not rupture, except when pulled wide apart. Thus the discontinuous nature that is typical of a hot tear. This also means that the discontinuous hot tear has formed before the metal is completely solid and therefore hot tears cannot be due to hot shakeout; cooling cracks yes; hot tears, no.

Fig. 8—Interrelation of four variables on hot tearing, as explained in the text



The hot tears to be discussed are not necessarily wide open ruptures; for that matter they are not necessarily visible to the unaided eye. With present day magnetic particle and acid etch specifications, the most troublesome hot tears are those that are invisible, and therefore this report concerns itself with any hot tear, no matter how small. This point in itself causes much confusion, especially from foundry to foundry. One foundry may think it is relatively free of these defects, and brag about it. If the boss of another foundry hears the first foundry's story and is in trouble, there is hell to pay. Everyone runs around in circles; much heat, but little light on the subject, is generated. Actually the reason for the confusion is a difference in inspection procedures. Many foundry tricks do not eliminate hot tears, they only make them invisible. Hot tearing today is in about the same state that internal shrinkage was 10 or 12 years ago, before general use of radiography. Radiographic experience has convinced most everyone that a casting is not necessarily sound just because no shrinkage is visible. Magnetic powder and acid etch testing are now convincing the foundryman that a casting is not necessarily free from hot tears, even though none are visible.

There are at least two types of hot tears—true hot tears and what the writer calls shrink cracks. The reason for this differentiation is that the cause is different, even though both ruptures occur during solidification. Hot tears occur due to restraint, as just described. Shrink cracks can occur without restraint. These shrink cracks are associated with definite shrinkage cavities, and are caused by atmospheric



pressure breaking through the weak casting skin to relieve the internal vacuum. If the casting skin above the shrinkage cavity is not uniform, but is rough or contains grains of displaced sand, the atmospheric break-through may take the form of shrinkage porosity rather than shrink cracks.

Shrink cracks are never found (in the writer's experience) if the area, usually a junction of sections, is even partially fed. For this reason they are relatively rare in production castings. It is quite easy to make both shrink cracks and hot tears in the same casting. They will occur consistently at different locations. Shrink cracks do not offer any unknown problems. The problem is how to position a riser or chill to feed that particular area and mainly the cost of so doing.

The foundryman must be sure that his diagnosis of shrink cracks, or hot tears, is correct. The futility of trying to eliminate a restraint hot tear by more or larger risers is self-evident; extra risers will probably make the hot tearing worse. Conversely, a shrink crack is not going to be helped by a softer core.

This article is not concerned with the false indications of magnetic particle inspection and deep etch that are causing plenty of confusion. That is a story in itself. It does behoove the investigator to prove that all indications are hot tears, otherwise confusion is compounded.

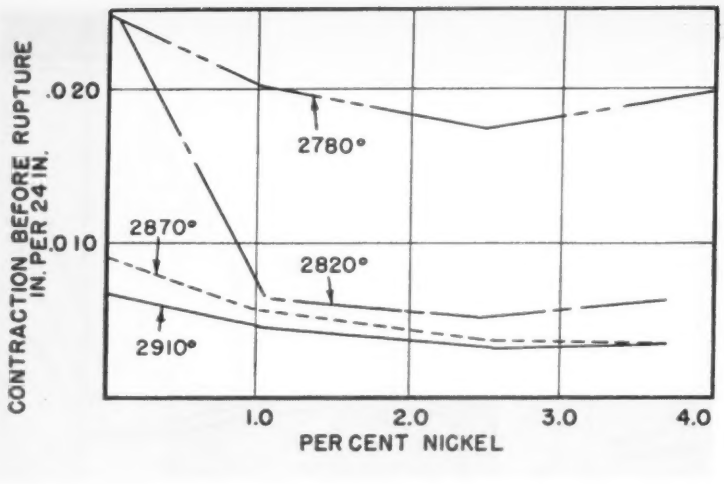
Temperature and Mechanism of Hot Tearing—Bishop, Ackerlind and Pellini[1] have recently contributed valuable information regarding the temperature and mode of hot tearing. Their investigational technique, radiography of the solidifying casting, is more accurate than that of previous investigations that depended on a measureable influence on a loading mechanism. They find that the first appearance of hot tears occurs at about the solidus temperature, when the metal is over 95 per cent solid. With further cooling under restraint, the hot tear becomes wider.

Fig. 3 summarizes data on hot tearing temperature. Bishop, Ackerlind and Pellini's[1] (hereinafter designated as B.A.&P.) hot tearing temperatures are about the solidus line of the iron-carbon phase diagram. The hot tearing ranges reported by Middleton and Protheroe[2], Hall[3], Bhattacharga, Adams and Taylor[4] are over 100° F lower. There are two reasons for these discrepancies. One is the greater sensitivity of radiographic method over previous methods. However, the chief reason is undoubtedly an improved method of temperature measurement.

As discussed by B.A.&P., thermocouples inserted into small castings at right angles to the metal-sand interface may read over 100° low. B.A.&P's method is to make a "U" of the thermocouple wires so that at least one inch on each side of the hot junction lies along the plane of temperature measurement. If the temperature of hot tearing of references (2), (3) and (4) are increased due to these two factors, the mechanically determined hot tearing ranges in Fig. 3 coincide closely with that determined radio-graphically.

B.A.&P.'s theory of the mechanics of hot tear formation answers a number of questions. They reason that hot tearing is due to strain concentration. When a metal that freezes dendritically approaches the solidus and is, say, 99 per cent solid, all strain is concentrated in the last 1 per cent of weak, liquid metal in between the solid dendrites. Dendritic solidification tends to form columnar dendrites at right angles to the mold face and these dendrites are usually at right angles to strain set up by hindered contraction. This orientation is the most favorable for interdendritic stress concentration and separation. The liquid interdendritic fillings have almost zero strength and allow separation at no, or very low, stress.

This explanation eliminates the shaky presumption of the existence of a brittle range in solid metal, below the solidus, and then a sharp increase to very



Figs. 14 (above) and 15-20 (below)—Additional examples of the effects of metal variables on strain before rupture (Middleton and Protheroe[2])

high ductility. Such behavior is theoretically improbable. If the separation occurs just before complete solidification, the rupture will act as a stress raiser in the solid metal and the rupture will widen, even though the unnotched metal has extreme ductility. Steel is acting at these temperatures just as it would at room temperature, differing only in degree.

Contraction (Strain) Required for Hot Tearing—If B.A.&P.'s micro strain concentration theory is carried to a macroscopic scale, it explains a number of puzzling results of other investigators. At the same time, a reanalysis of results in the light of strain concentration emphasizes how important this variable is in hot tearing and why the writer lists this variable as the most important.

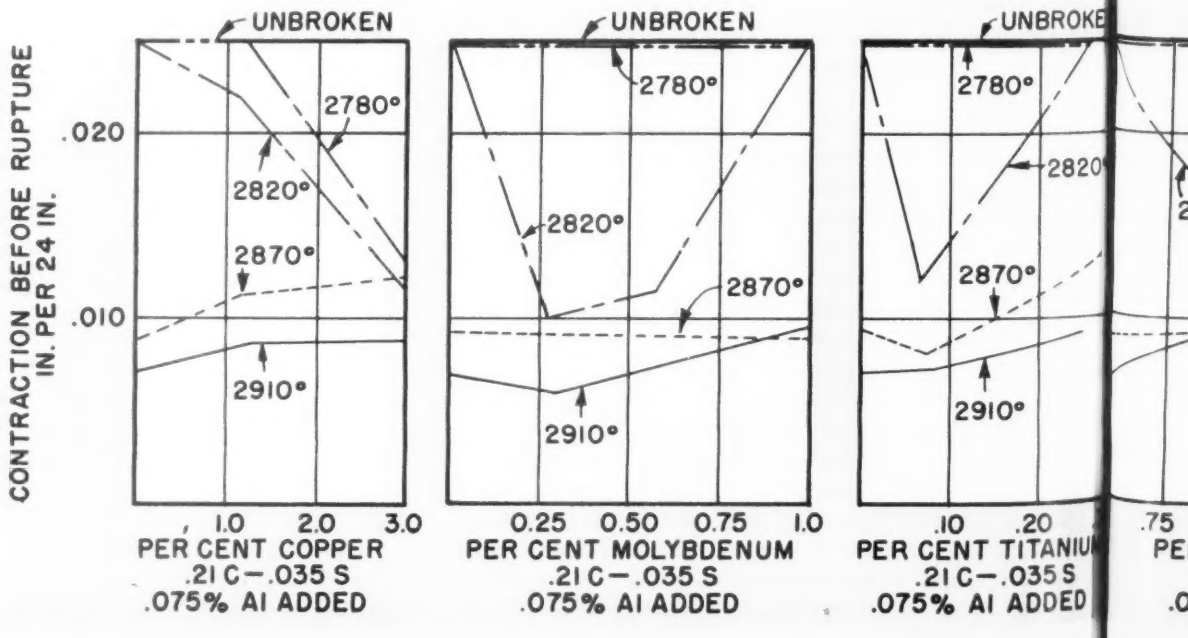
Hall[3] has shown that a hot spot as little as 0.1-in. larger than a uniform ½-in. section means the difference between no rupture and complete separation of a 22-in.-long casting restrained by flanges on its ends. One series of Hall's test castings is shown in Fig. 2. Hot tearing at the flange junctions is prevented by large brackets. Then, as shown in Fig. 1, this casting can be made to rupture or not rupture by varying the length of the bulb causing the hot spot, thereby varying strain concentration.

Lillieqvist and Fuqua[5] have shown an even more precise relation between hot tearing and strain concentration at a hot spot. They found that a variation in width of the slot gate in the AFS cylindrical test casting of only 0.020-in. was a major variable.

Wyman, Faist and Sylvestro[6] show a more complex relation with the same test casting. They control the area of the slot gate precisely by grinding it to size. With some core sand mixes the test casting will not hot tear with a narrow gate, then will hot tear, and again not hot tear as the width of the slot gate is increased. With other core sand mixes the width of the hot tears as well as their length decreases as the width of the slot gate increases.

All these seemingly conflicting behaviors can probably be explained by the strain concentration theories. If the temperature gradient throughout the casting is small, strain due to contraction is not concentrated at one spot and hot tearing cannot occur. If the geometry of the casting is such that a hot spot is formed, strain is first concentrated in that area on a macro scale, then concentrated in the interdendritic fillings on a micro scale. Rupture then occurs in the weak interdendritic fillings. If the hot spot is spread out sufficiently, strain on a macro scale is dispersed sufficiently so as to be below the rupture point on the micro scale and no rupture occurs.

The preceding may seem involved and highly theoretical, but its importance cannot be overemphasized. There are many designs that themselves create such unfavorable temperature gradients that foundry tricks cannot overcome them. A redesign is necessary as the best solution to hot tearing. Such redesign must be based on the strain concentration theories. The



preceding examples indicate that many times only a slight design change will make a great difference in hot tearing. Then too, the strain concentration theories offer a method of quantitative evaluation of the degree of hot tearing that can be expected to yield valuable information for use in the foundry itself.

Strain (Contraction) Concentration—If data presented in reference (1) is combined with that in reference (2), information on the temperature drop and contraction (strain) required to initiate a hot tear is obtained. Although the absolute temperatures are divergent, the relative temperatures are in good agreement. B.A.&P. report temperature drops for steel, between the last radiograph showing no rupture and the first radiograph showing a hot tear, averaging 40° F, with a range throughout the analyses studied of 15 to 75° F. The range for aluminum that solidifies and hot tears like steel was 25 to 40° F.

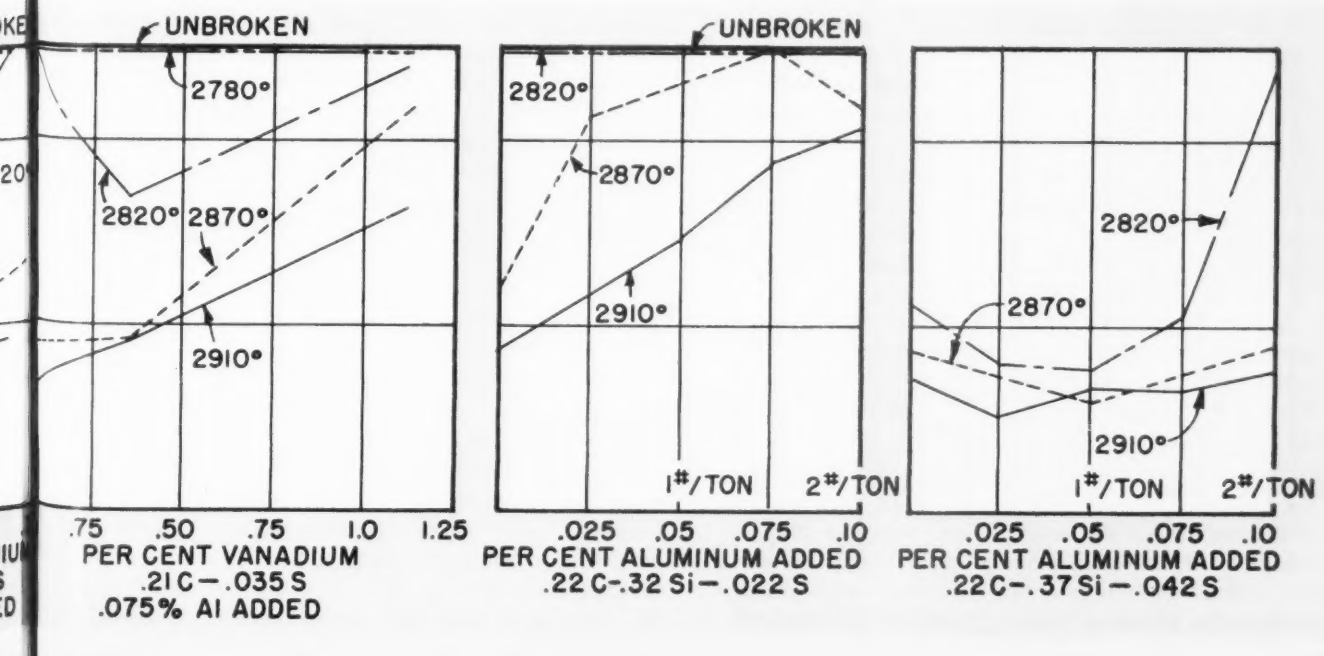
Although the restraining mechanism used in reference (2), springs, was entirely different than in reference (1), the results are similar. This investigational procedure gives more accurate strain measurements, as the spring deflection can be measured to thousandths of an inch. The temperature drop required to cause rupture to a degree noticeable on the loading mechanism was 50 to 60° F. Therefore, it seems safe to assume that a hot tear will form under *moderate* strain concentration with a decrease in temperature in the order of 25 to 50° F. The writer has used a rough average of 40° F as the first approximation in the following calculations.

The relation between contraction temperature and rupture from references (1) and (2) are shown in Fig. 4. The slopes of these lines correspond to a linear contraction of .0000060 in./in./° F to .000012 in./in./° F. Agreement is not bad considering the crudity of some of the measurements. The contractions quoted from reference (1) were determined by visually measuring the increase in width of the hot tear on prints of the original radiographs. The average contraction, in and slightly below the hot tearing range in Fig. 4, is .0000094 in./in./°F. This corresponds closely to unhindered contraction of cast steel of .000010 in./in./°F as determined by Briggs and Gezelius[7]. Patternmaker's shrinkage of ¼ in./ft is equivalent to .0000079 in./in./°F contraction. Even though the second significant figure in the preceding contractions is open to question, it can be said with certainty that thermal contraction in the hot tearing range is in the order of .00001 in./in./°F ($.1 \times 10^{-4}$ in./in./°F). This value is accurate enough for preliminary calculation and can be determined more precisely if need requires.

Regardless of questions as to the accuracy of the values in the preceding paragraph, the test pieces used in references (1) and (2) ruptured with total contractions between .005 and .010 in. when conditions of restraint and temperature were favorable for rupture. If these contractions are concentrated in the hot spots, concentrated strains are set up approximately as shown for the various test specimens in Fig. 7.

The strain concentrations given in Fig. 7 are calculated by multiplying the contraction (.00001 in./in./°F) by the length of the contracting member. If the test casting is circular, the inside diameter is taken as the length of the contracting member. The overall contraction is then divided into the length of the hot spot, or sum of hot spots if more than one is present. These values are plotted on the vertical axis. Exact hot spot lengths can be obtained only from Hall's test specimens, for these lengths are fixed precisely by geometry.

A fair approximation of the length of hot spot at the junction of sections in the writer's test specimen can be obtained from the shape and length of the hot tear. Only guesses can be made regarding the length of the hot spots in the other test castings, for the length is determined primarily by gating and metal flow. The values used are (*Please turn to page* 289)



Internal Porosity and Inverse Segregation in WHITE CAST IRON

The author describes the behavior of solidifying metals which results in internal shrinkage. Although no attempt is made to outline methods of eliminating porous spots and inverse segregation, a discussion is presented of the forces which are active during solidification and which should be balanced in the attempt to produce sound castings

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THIS article is concerned with the formation of porous spots and with inverse segregation within those spots during the freezing of white cast iron—also called "hard iron"—with the chemical composition used to produce malleable iron castings. Although no attempt is made to outline methods of eliminating these defects from castings, the application of certain techniques can minimize internal shrinkage and inverse segregation, thereby producing sounder castings.

Comparisons are also made with both cast steel and gray iron in order to show the solidification difference between the as-cast ferrous metals.

The bibliography will confirm most of the statements and data in the paper. The remarks about the chemical composition of metal in the porous or shrink area, which reveals quantitatively that inverse segregation takes place during the period of solidification for plain and alloy white cast iron, are an exception.

In this article, normal segregation is considered to be an accumulation or gathering of an element or elements in one or more areas, whereas inverse segregation is the depletion of an element or elements in one or more areas. Inverse segregation represents the chemical heterogeneity of the dendrite or primary crystal minus all or part of its fillings.

Obviously, the physical properties of a porous casting are different from those of a casting free of porosity. For this reason, porosity should be confined as much as possible to the discard portion of a casting—to the gates and feeders. Because the chemical composition of hard iron controls the freezing range, this problem is a complex one of mechanical control, in which many variables play a part.

These variables include casting design; uniformity of sections and of distribution of mass; proper gating and feeding arrangement; elimination of sharp corners and re-entrant angles; chills, cooling fins, insulation and exothermic materials; condition of sand and cores (moisture and combustible content and permeability); adequate venting; pouring temperature of metal and speed of pouring; occluded gas content and chemical composition of metal, and condition of molten metal.

Of all the variables, casting design, casting temperature, mold construction and method of filling the mold are probably the most important since they may be varied to produce the desired conditions of progressive solidification. Each casting must be treated individually, but the method used should be such that the first metal poured is located in

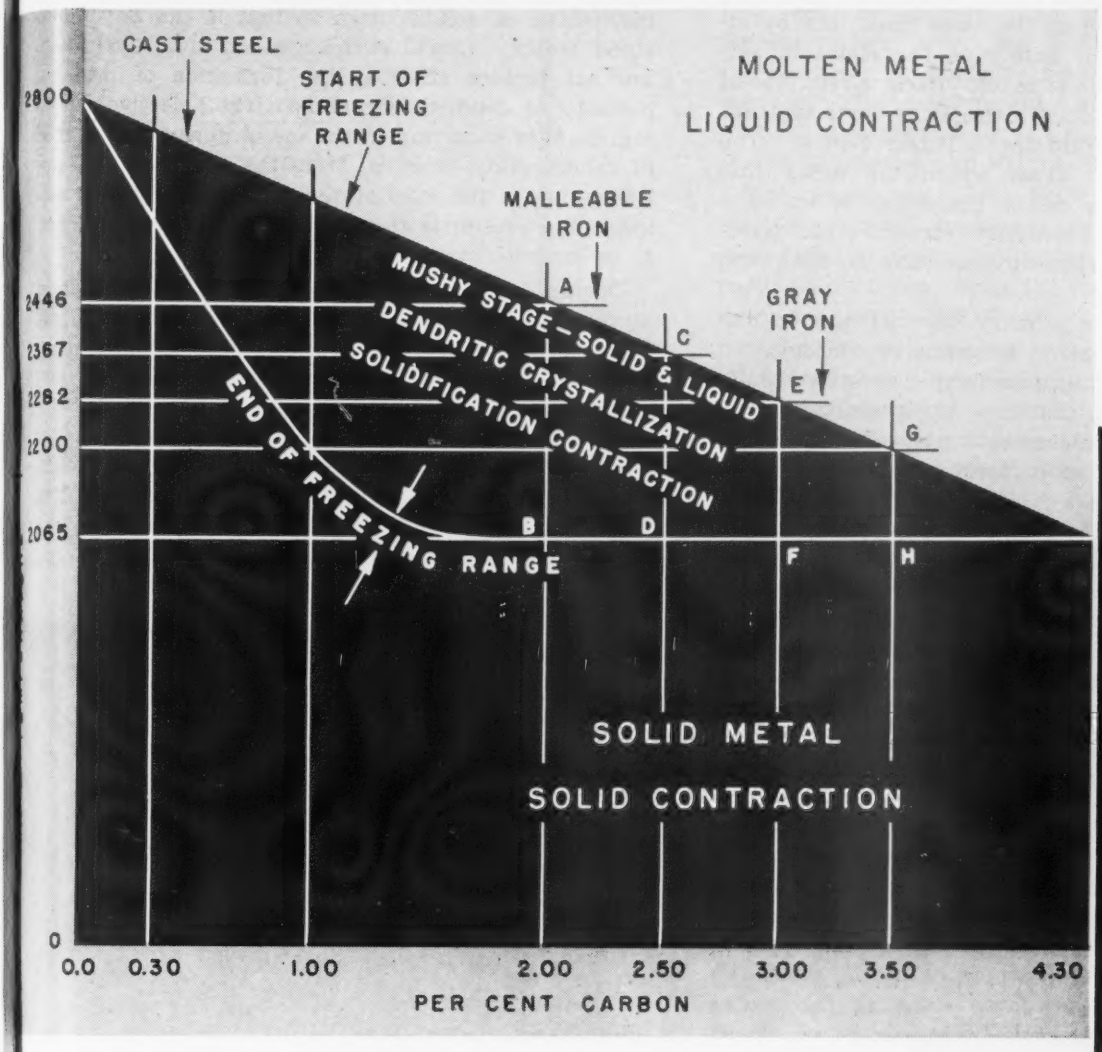


Fig. 1 (above)—Chart illustrating freezing ranges of cast steel, malleable and gray iron

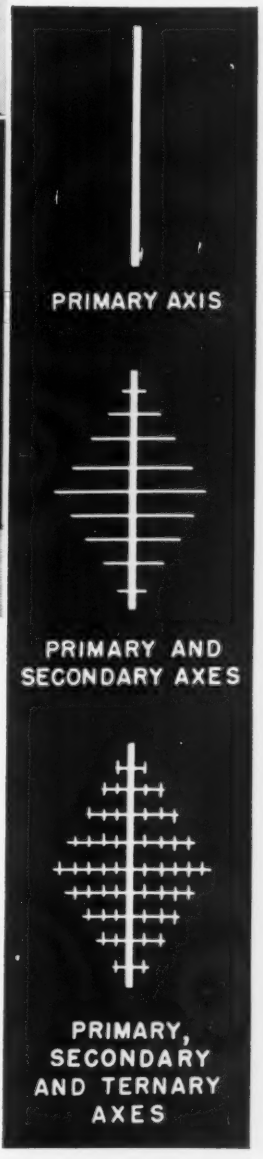


Fig. 2—This sketch shows formation of a dendrite during metal solidification

the parts of the casting removed from the feeder, where it will soon become cold, and that the last metal poured remains hot in the feeder and adjacent parts of the castings.

This method and the proper pouring temperature can be established best if specimen castings poured at various temperatures are sectioned and their fractures examined for shrinkage cavities or other imperfections. A nondestructive test method may be used, too. Generous gating and risering permits a wider range of pouring temperatures than an inadequate gating technique does.

Chills, which may become part of the mold construction, are applied under a certain set of conditions to help equalize the speed of solidification. Their effect is similar to that of reducing the dimensions of the mass involved.

The size of a chill is important. If the mass is too small, the speed of solidification will be too slow to prevent porosity in the immediate vicinity of the chill. If the mass is too great, other unfavorable conditions may develop. Therefore, the mass of the chill should be such as to eliminate porosity in its immediate vicinity and at the same time to prevent porosity from being transferred to another part of the casting.

Insulation material has an effect contrary to that of a chill, similar to that of increasing the dimensions of the mass involved. Chills and insulation materials are used as a means to even out section size in an effort to promote progressive solidification, experience and judgment being required to produce the best results.

Because of their shape and varying thicknesses, many castings will not solidify uniformly. As a re-

sult, liquid, solidification and solid contraction may occur within a casting at the same time, thereby interrupting the normal action of the metal in setting into a homogeneous mass. Parts already solid tend to contract and draw metal away from adjacent parts that remain liquid for a longer period. The absence of a source from which the areas that freeze last can draw metal therefore results in a porous condition or a dendritic structure of macroscopic size brought about by selective freezing and unequal solidification.

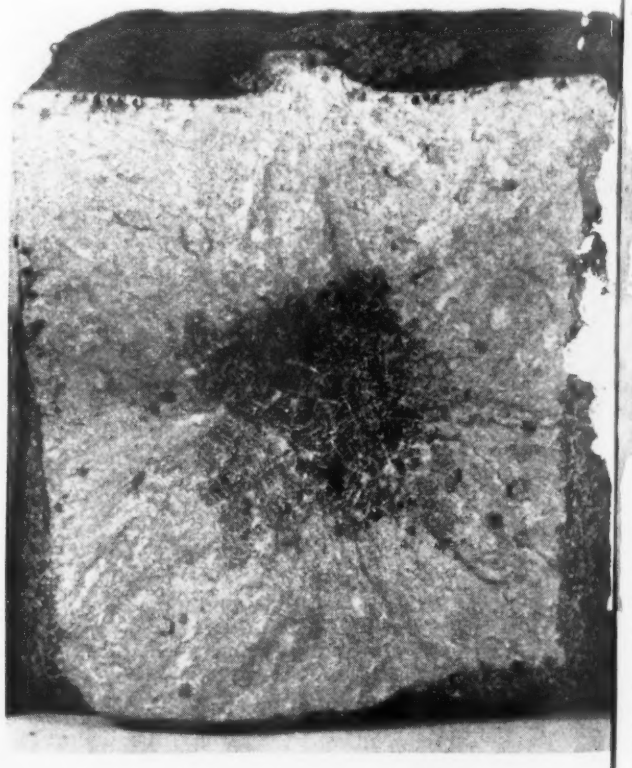
Internal porosity or primary crystals may be distributed widely throughout a casting or concentrated in one spot. Preventing macroscopic porosity results in a practically sound casting. Any porosity or dendritic formation that does occur will occur locally in each crystal and be so uniformly distributed as to be of microscopic size.

A lower pouring temperature should produce a more nearly sound casting since it should produce a more favorable temperature distribution and result in some self-feeding of metal within the casting. The hotter the metal is poured, the greater the difference between solidification rates and cooling rates of thin and heavy sections will be. These conditions favor the formation of porosity. If casting designs call for a hot metal, it is essential that these castings be fed properly.

For the study of internal porosity or dendritic growth (dendrites: from the Greek word for "tree") and inverse segregation, a test block casting 3 x 3 x 7 in. was selected. It was cast without a feeder in order to promote internal porosity or dendritic structure. The block was cast in a sand mold, V-notched horizontally on three sides at the center to permit fracture to take place transversely at that point. Porosity could have been prevented if a continuous amount of molten metal had been supplied by a feeder designed to possess a slower freezing rate than the casting. This step would have eliminated the porous, treelike structure from the casting by transmitting it to the feeder.

Before proceeding further, we should review the mechanism of solidification so that it can be understood better. Liquid shrinkage and solid shrinkage are not factors affecting the formation of internal porosity or dendritic structure. The selective freezing changes occurring in the metal during the period of solidification—that is, from the first point of solidification to the solid state at the end of the freezing range—result in the formation of internal porosity or dendritic structure (Fig. 1).

During its transition from the molten to the solid state, metal loses its homogeneity or uniformity and becomes a more or less heterogeneous mass. Other factors being equal, the amount of porosity or dendritic growth increases or decreases with the volume of the mass; the larger the cross-sectional size of the mass, the more time is required for solidification. In other words, porosity or dendritic growth in a hard iron casting is directly dependent upon temperature and time of solidification.



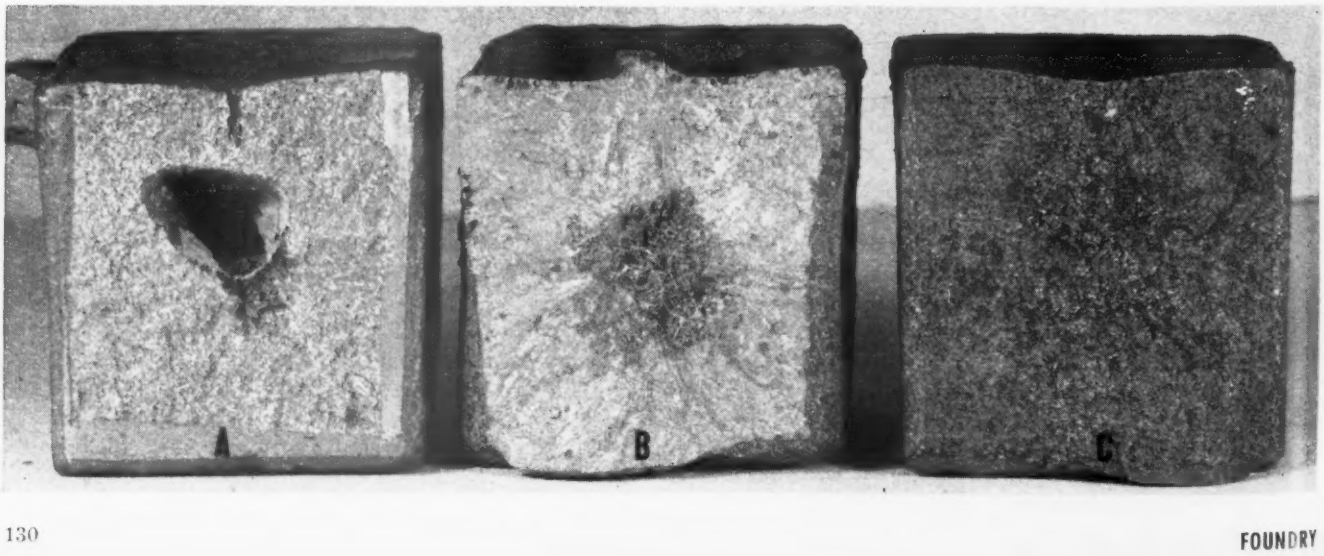


Fig. 3—Test blocks, 3 x 3 x 7 in., cast without feeder. *A*: Cast steel—cavity (1 per cent carbon). *B*: Hard iron—dendrites. *C*: Gray iron—solid metal. Right—Enlargement of shrink area in hard iron

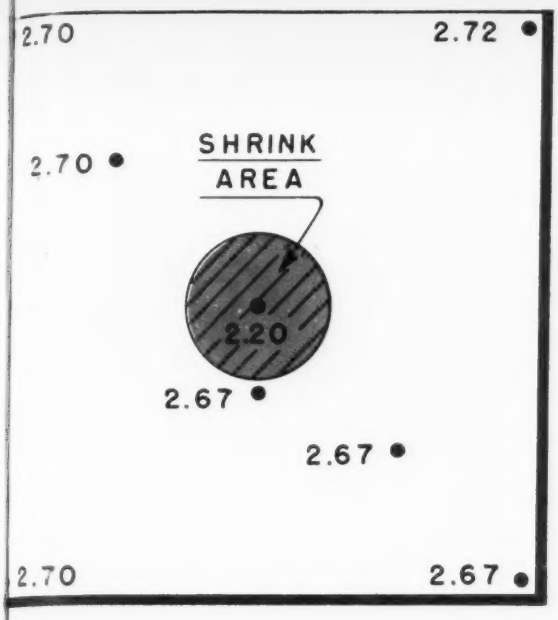


Fig. 4—Fractured face of test block casting showing the areas checked for carbon

In its molten state, metal is a chemically homogeneous, liquid solution. We are interested in what happens as it solidifies. In the molten state, atoms are free to move to and fro and possess no regularity of position. As solidification takes place, some atoms begin to arrange into groups, with the formation of dendrites or primary crystals of treelike growths, rich in the elements which raise the freezing point of the metal (Fig. 2).

The iron at this stage may be composed partly of liquid iron and partly of solid iron crystals. Growth of primary crystals from melt does not take place simultaneously in all parts of the liquid. The first nuclei of crystallization are formed by atoms combining to form a primary crystal. Once formed, the dendrites continue to grow as long as the temperature is sufficiently high. When it drops to a certain value (the freezing point), growth stops, regardless of size.

At first, primary crystals are only skeleton crystals with a pine tree structure; for this reason, they are called "dendrites." These dendrites form all the time while the temperature is falling, taking out of solution proportionately more iron, silicon and manganese than they do carbon, phosphorus and sulphur and resulting in an increased concentration of the latter in the molten mass. The whole body of the block gradually contracts as solidification occurs.

By cohesive action (molecular attraction by which the particles of a body are united throughout the mass, whether like or unlike), there is a tendency for the low freezing point compounds of higher fluidity to become segregated, leaving the metal with a higher freezing point and lower fluidity adjacent to the primary crystal. The bulk of the carbon, phosphorus and sulphur therefore remains fluid longer and concentrates between the boundaries of the dendrites, causing dendritic segregation.

This segregation is brought about by selective freezing and the fact that some elements or compounds are slow to diffuse. In the case of white iron, we also have another reaction taking place. Excess carbon, about the eutectoid composition, is rejected to the dendritic boundries as massive cementite. This development also is true to some degree for phosphorus, for the solubility of phosphorus in iron is decreased in the presence of carbon.

The dimensions of the dendrites consisting of primary axes with branching secondary and ternary axes (Fig. 2) depend on the rate of solidification. A rapid solidification causes the appearance of a greater number of nuclei and, therefore, of smaller dendrites.

If solidification is slow, comparatively few centers of crystallization are set up, and the resulting dendrites continue to grow until the temperature drops to a certain level. Cavities are formed between the growing dendrites or primary crystals as a result of contraction.

Hence, the area or size of these cavities depends on the speed of solidification, and their number depends on the mass and cross-sectional area. With a large mass and cross-sectional size, the total area of the interstices to be filled by the low melting compounds therefore will be greater than if solidification were rapid. If solidification is rapid, the dimensions of the dendrites decrease, for time and temperature do not allow them to grow.

Compare Steel and Gray Iron Test Blocks

As a matter of interest, let us also cast our 3 x 3 x 7-in. test block from commercial steel and from gray iron to compare the as-cast structures with that of hard iron (Fig. 3). As the mold is being filled, the molten metal covering its surface begins to set immediately. This condition results in the formation of primary crystals (dendrites) that form a solid shell on the outside of the test casting.

By the force of cohesion, this shell of solid metal draws toward itself the low-temperature mushy metal adjacent to the primary crystals which has the most fluidity and the least resistance to movement by cohesive action. This process continues as the casting solidifies, the outer and faster-freezing sections setting, contracting and getting all the molten metal needed to satisfy this normal contraction from the inner or adjacent liquid metal.

At the same time, as more and more metal solidifies, liquid shrinkage accompanying the falling temperature tends to form a partial vacuum within the solidifying mass. The amount of liquid shrinkage in any particular casting depends on the as-cast temperature of the metal used (Fig. 1). If there is sufficient molten metal from a feeder, gravitational and atmospheric forces will supply metal to the casting.

This action tends to prevent the formation of any vacuum within the solidifying casting and to help prevent the formation of a void or cavity. If the casting is not provided with liquid metal, however, either macroscopic or microscopic interdendritic voids can form.

Because the drawing force of cohesive action increases as the temperature of molten metal decreases, the force of cohesion is the greatest when metal is in the plastic state. (*Please turn to page* 284)

Nature adds to the attractive setting of American Brake Shoe Co.'s foundry at Pomona, Calif.

New Brake Shoe Foundry

Operating in California

AS PART of an expansion and modernization program which has been under way since the end of the war, the Brake Shoe & Castings Division of American Brake Shoe Co. has recently constructed and put into operation a modern foundry at Pomona, Calif. for brake shoe production.

The new plant, which adds 50,000 square feet to Brake Shoe facilities, is located on a 47-acre site serviced by sidings from two different railroads. The building is of steel frame construction with tilt-up concrete walls and is one-story throughout, except for offices and sand storage equipment.

Fluorescent lighting is used in all offices, and the foundry is illuminated with twin-fixtures, each fixture consisting of a mercury vapor lamp and an incandescent lamp mounted together. Continuous sash windows provide additional light.

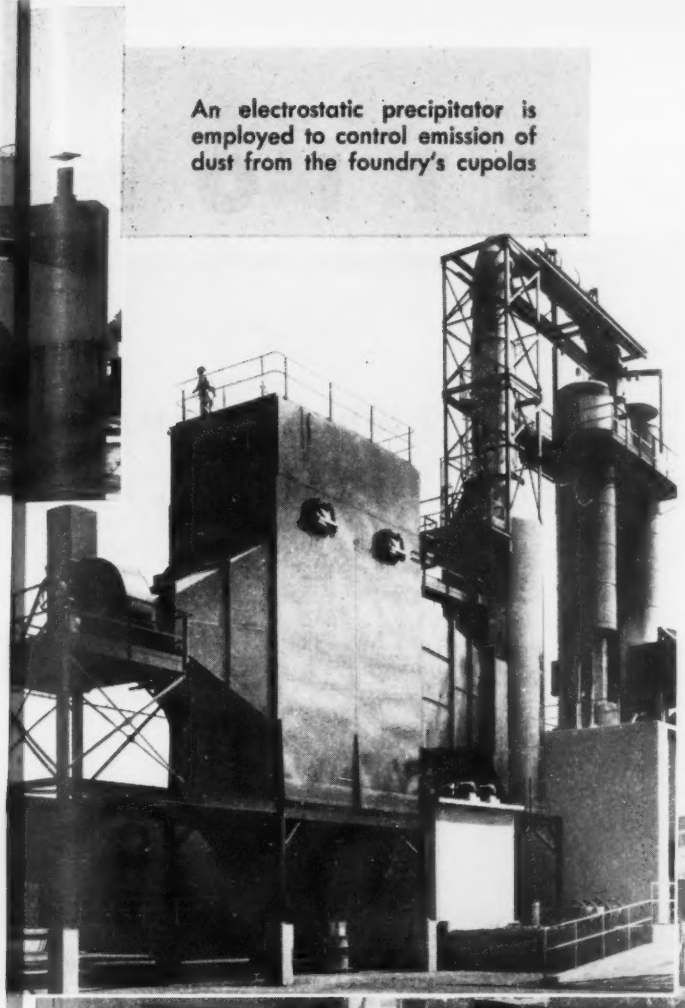
Including an elaborate smog-control system and the latest in sand and dust control equipment, the new plant exhibits many features which presage a day of almost completely automatic operation.

Raw materials are weighed in the cars on yard platforms and handled mechanically from that point on. Sand is conveyed to a large concrete silo above the building, where it is stored adjacent to bins containing other necessary molding materials. The sand conditioning system accepts mold sand as required and automatically controls the exact mixture of water and other ingredients.

The muller is fed any one of, or any combination of, seven ingredients. It can be supplied with new sand from two bins, with shakeout sand, with water, with seacoal, and with binding clays from two bins. Should all molders' hoppers be filled, the muller stops automatically; should any gate drop, a light on the panel indicates and the muller takes ingredients in the required ratio, mixes, and discharges automatically until all molders' hoppers are full. One man handles the entire operation with push buttons and it seems probable that in time even his duties will be handled automatically.

Scrap is loaded from the storage yard onto a scale outside the rear of the building by means of an electromagnet crane. When a charge of proper weight and composition is assembled, a button is pressed, the load moves automatically up a ramp, and is then dumped into the cupola. Two cupolas supply the melt for the plant. Hot metal is transported from the cupola to the two sets of pouring ladles at the pouring station by means of a lift truck with a ladle attachment on front.

Three mold production lines are presently operating in the Pomona plant, each line originating at a molding station. One molding station consists of a drag molder at a jolt and roll-over machine, a cope molder at a similar machine directly in line, and a mold closer working at a rotary table next in line inserting cores and chills and closing molds. A roller



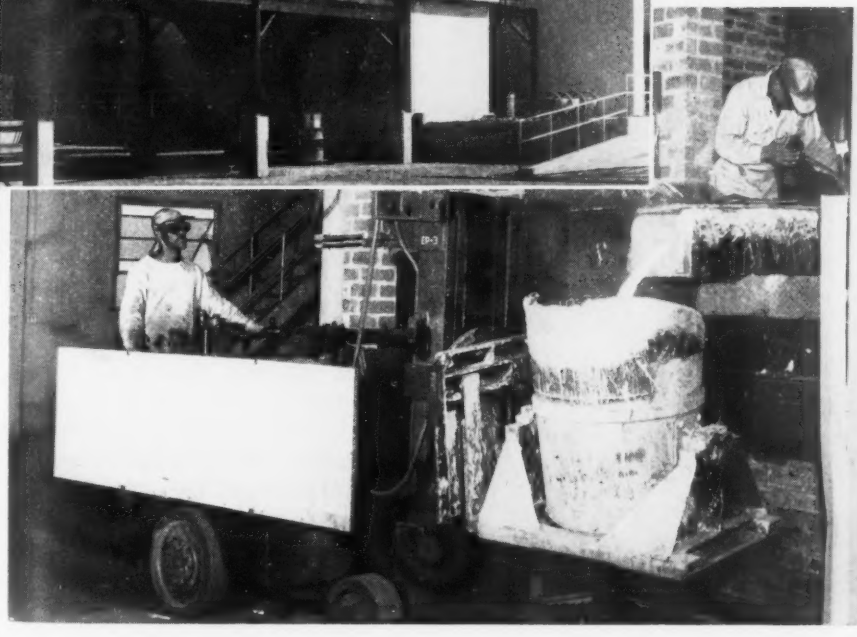
An electrostatic precipitator is employed to control emission of dust from the foundry's cupolas

molds then move down the line to a stacker operated by push buttons and are stored to cool.

When cool, the molds feed off the opposite end of the storage line onto another roller conveyor which moves them toward the shakeout. Here again, one man controls the entire operation. When the flasks are empty they are conveyed back to molders' stations.

Sand, chills, and brake shoes from the flask drop onto a vibrating screen which drops sand through to a vibrating deck immediately beneath. Vibration moves the metal and sand off onto a two-level belt conveyor system. The lower belt carries sand to a screen where it is screened and dropped below floor level to the spill belt that carries excess sand from molders stations to a bucket elevator, and then up to the sand conditioner.

The upper belt carries brake shoes and chills to a station where one man picks out chills and tosses them into bins. He also knocks off gates and risers, and returns them to the belt, where they are carried off to join shop scrap. The brake shoes he hangs on a monorail conveyor immediately behind him, two to a hanger. The monorail conveyor carries shoes to a blast cleaning room, makes a U-turn



Lift truck equipped with ladle on front is used to transfer hot metal from the cupola to the central pouring area

conveyor passing down each side of this team carries away their completed molds, and this constitutes one production line. Floors around the molding stations are grated, and all sand which spills through the grates falls to a conveyor belt under the floor and is returned to the sand conditioner.

Complete molds pass down the roller conveyor line a distance of approximately 50 feet, where they are loaded on a transfer car and taken to be poured or into storage. When taken from storage, the same transfer car moves the molds to another roller conveyor line which takes them to the pouring area. Here, from a central station, one man controls the pouring. A ladle truck shuttles between cupolas and pouring ladles, keeping them supplied. Poured through the room, and carries them back along a line of chippers and grinders. As hangers reach the benches, the chippers pick off the shoes, chip, and pass them to adjacent grinders, who grind and stack them on tote boards for cleaning and shipment.

Neither of the two cupolas exhausts to the atmosphere, but into special dust control equipment. One stack draws off smoke from both cupolas, feeds it to a cooling tower, and then to an electronic precipitator where all dust is precipitated out, before the air is passed on by a 40-hp fan that moves air through this path. The cupola dust arresting equipment cost approximately $135,000 to install, and this is in addition to the usual dust control equipment throughout the foundry.

QUESTIONS

Fracture at crack reveals shrinky area . . . . . .

Shell mold will work . . . . . Cast brass on steel

Unalloyed gray iron composition for stoves . . . . . .

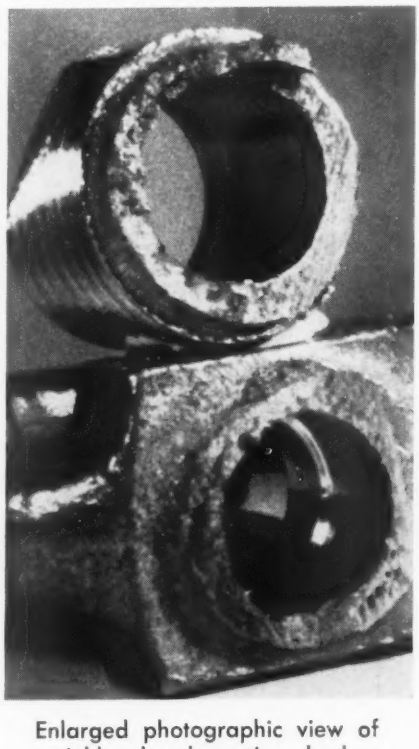
Shrink Causes Casting Crack

QUESTION We are making sprinkler head castings in 85-5-5-5 alloy poured at 2100° F and cleaned by tumbling with steel shot. As you will see from the several specimens forwarded, a crack develops in the neck of some of the castings. During our daily inspection of castings we could not find this defect, but it was called to our attention after machining. An inspection of 1200 pieces showed only 42 that were cracked. In machining, the casting is held by the square section from which the harp extends. Can you tell us the cause of the defect?

ANSWER Examination of fractured castings at the place where the cracks are present leads us to the opinion that the defect is a shrink. The area where the cracks occur is approximately two-thirds the thickness of the adjoining section when the core forming the hole is in the exact center. That is, the portion to be threaded is 3/16-in., and the necked down portion where the cracks occur is ⅛-in. thick. However, those that had the cracks showed the core off center, with the crack in the thinner section. Fracture across the crack showed the feathery, dendritic structure associated with shrinkage.

Best remedy, of course, would be to eliminate the neck-down portion since, so far as we can see, it serves no useful purpose, even from an aesthetic point of view. Pattern and corebox equipment should be examined to insure that the prints for the cores are centered and that the cores are round. Possibly the trouble can be alleviated by increasing pouring temperature of the metal. Present temperature loss from beginning to end of pouring may be sufficient to cause the defect. We suggest that you take temperature readings on the last molds poured. Segregate the castings through cleaning and machining for checking, then take whatever action is appropriate.

Although as you indicate, the loss on the piece basis is 3.5 per cent, and does not appear too bad,



Enlarged photographic view of sprinkler head casting broken at crack area revealing porous dendritic structure at the left. Enlargement about twice size

we believe that you will discover an entirely different picture when you determine the loss on a value or cost basis. Cost of a piece discarded on shakeout is an entirely different matter from cost when the piece is rejected after complete machining. Get the figures together and convince yourself that a little time and effort will save considerable money.

Tank Treads in Shell Molds

QUESTION We have the opportunity of bidding on a sizable order for manganese steel track links for tanks. Outside of considerable reading on the subject, we are not familiar with shell molding practice. We have been told that shell molding is not as simple as it sounds. The casting, 22 in. long, 10 in. wide, ½-in. thick, weighs about 35 lb. Up to the present we have not read of any manganese steel castings made in shell molds. Making the casting does not seem to present any difficulty. The catch is in the tolerances, about 1/64 (30 thousandths) in the hinges and pin holes. Still worse is the "wrap" test where the links are assembled in sets of eight with seven pins inserted, wrapped around a machined sprocket and the final pin inserted —all without machining.

ANSWER Shell molding is satisfactory for manganese steel castings. We know of at least one job that is going to be made that way in this country. However, the shell molding method is more expensive than sand molding, either green or dry sand. The pin holes, and we should suppose the hinges, could be drifted if necessary to meet the required 1/64-in. tolerance. Without a drawing it is a little hard to visualize the hinges, but you should not have any excessive trouble on that score.

The wrap test is something else again, as it means the distance between hinges or pin holes on each link must be held to a high degree of accuracy. Shell molding would meet that requirement, something that would be hard to meet in green sand snap flask work.

We do not know whether the dimension and the setting of the cores will have a determining influence on the center-to-center dimension of the hinges or pin holes. If so, the making and setting of the cores would be vitally important. We

ANSWERS

should suppose a core blower, metal coreboxes and well made core racks would be the best way to make them. Well made oil sand cores dried on good racks should be quite close to dimensions. Shell molds should insure accurate setting of the cores.

Casting Knob on Steel Shaft

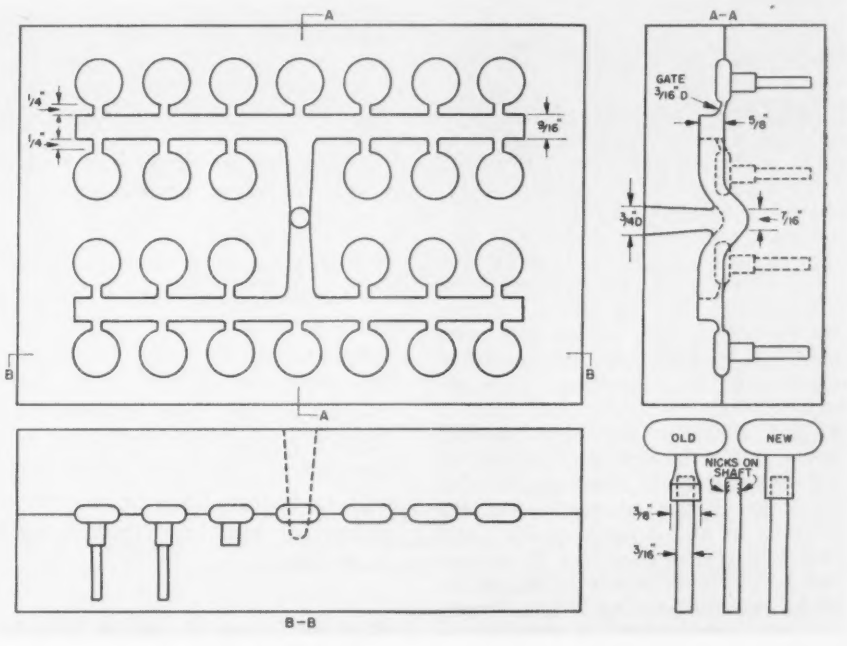
QUESTION We are considering taking on a job which requires the casting of a steel shaft into a brass knob as shown in the accompanying sketch. We wonder if you can give us any information relative to methods used in such work. We wonder if the brass will not have a tendency to kick off when it comes into contact with the shaft. Does the portion of the shaft projecting into the brass casting require any special coating or treatment? In your opinion, where would be the best location for the gate on this part?

ANSWER With a little care and attention, it should not be too difficult to produce the brass knob cast around a steel shaft. Essential requirements are that the steel shaft be free from rust, oil or other dirt. It also should be dry and preferably at a temperature slightly higher than that of the molding sand, to prevent condensation of moisture while it is sitting in the mold prior to pouring.

We do not believe that the design submitted can be used, for at the top of the shaft projecting into the brass knob, there is practically only a thin shell of metal. Making the sides of the shank or stem straight will eliminate that objection. Portion of the shaft projecting into the knob should be nicked, serrated, or roughened in some manner so that the metal in the knob will grip it tightly and prevent turning or pulling out.

To prepare the shaft, we suggest abrasive blasting to insure that the end of the shaft to be surrounded with metal is as clean as possible. Then the clean shafts can be placed in a core oven, for example, to keep them warm and dry previous to use. As indicated previously, the temperature need be only slightly above that of the molding sand—in any event, not so hot that the shafts cannot be handled with bare hands by the molders.

As indicated in the accompanying sketch, we suggest producing 26 knobs in a 10 x 14-in. flask. The drag pattern contains holes into which the shafts are set previous to placing the sand and ramming. Naturally the relationship of the holes in the pattern to the inserted shafts should be such that the shafts are held in the proper vertical position, but not so tightly that they will remain in the mold when the pattern is drawn. Another method, of course, would be to have the pattern leave holes in the mold into which the shafts are inserted before closing. Molds should be poured without delay to avoid the possibility of moisture condensing on the shafts.



Various views of a suggested procedure for gating small brass knobs which are to be poured around steel shafts. Change in stem shape is required to provide sufficient metal at the top of the steel shaft

Composition for Stove Parts

QUESTION In our foundry in Brazil we make domestic wood-burning kitchen stoves, and we would like to know the most suitable non-alloy composition which will resist warping and oxidation. We have available plenty of charcoal pig iron, a little cast iron scrap, low-carbon steel scrap, and 30 per cent returns from the foundry. What proportions of these materials do you suggest?

ANSWER Due to the comparatively thin sections in stoveplate castings the silicon content is relatively high—usually around 2.50 per cent. This insures a gray fracture without hard edges or areas.

Manganese content is about 0.60 per cent, sulphur as low as possible, and the phosphorus around 0.50 per cent, although some believe that higher phosphorus gives greater fluidity. Carbon content should be as high as possible.

Since we do not know the composition of the charcoal pig iron and the foundry returns, we cannot suggest the possible proportions of each in a mix, but if you have pig containing about 3 per cent Si, you might try a mixture containing 70 per cent pig and 30 per cent foundry returns.

Even if the silicon content of the pig does not run that high, try the mix on one charge and note the results on the thinnest sections. If they are gray throughout without any chilled edges, it will be satisfactory. Should chilling occur, it will be necessary to obtain some higher silicon pig or use ferrosilicon. If the latter is employed, we suggest that you add up to 0.50 per cent Si in the ladle.

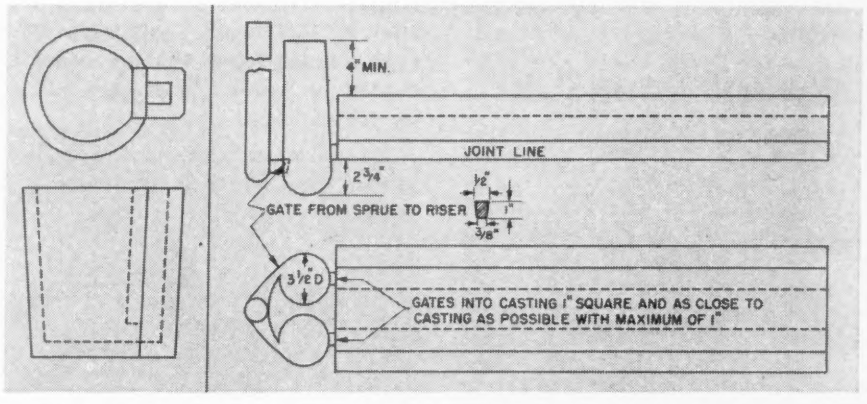
Machined Castings Show Dirt

QUESTION We are making gray iron castings, similar in shape to a half-shaft coupling, in three or four sizes weighing from 75 to 165 lb, which are machined all over. We are having considerable trouble getting clean castings, primarily because of slag and other impurities in the iron. We use runner boxes and metal strainer cores and have tried bottom gating as well as other methods without success. Our cupola is lined to 28 in., and iron is tapped directly into top-pouring ladles. We do not use cupola or ladle flux. Iron is clean enough for the general run of work, but we want to be able to get really clean iron when the need for it arises. Can you give us any information on use of bottom-pouring ladles, fluxes, etc., and recommend a publication or manual which would help in our cupola operation?

ANSWER From this distance it is difficult to tell whether your trouble with the castings is due to the method of gating or to dirty iron. One of the first suggestions is to try a "teapot spout" ladle for pouring, as indicated in the accompanying sketch. It practically gives the effect of bottom pouring since the metal has to pass under the brick barrier which holds back the slag, etc.

If it is in the method of gating we suggest the application of blind risers or shrink bobs as advocated by Winte and Barlow in the August, 1945 issue of FOUNDRY—a method said to be quite successful in producing a wide variety of sound, gray iron castings. Molten metal from the sprue, as shown in the accompanying sketch, enters the shrink bobs at a tangent and gives a spinning action which carries any dirt upward into the bobs and not into the casting. Bobs close to the casting as indicated create hot spots at the gates and provide excellent feeding.

As far as cupola operation is concerned, we suggest that you obtain a copy of *Handbook of Cupola Operation.* Possibly you can eliminate some trouble by using limestone to the extent of 3 per cent of the weight of the iron charge. The stone is placed directly on the coke, starting with the bed. Slag formed will, of course, have to be removed either by back or front slagging operation.



Blind riser or shrink bob method of gating and risering as advocated by Winte and Barlow is proposed to eliminate dirty areas in a casting

Bottom Doors Break at Hinges

QUESTION In the past two years we have had two bottom doors of our 91-in. cupola shear off at the juncture of hinge and door. Doors are semicircular, cast with hinges in place and weigh about 1700 lb. Do you know of attempts to use a cast iron door with fabricated steel hinges? Would it be possible to use a thin steel plate overlaid with a cast iron plate? We attribute the failure of these doors to the hinge's striking the cupola base plate on the back swing when the bottom is dropped. Can you suggest a means of decelerating the door so that it cannot strike the base plate? We have used tighter hinge pins, but they caused the doors to stick and resulted in other trouble.

ANSWER While possibly your difficulty with the cupola bottom doors may occur from time to time, it must be rather rare since we do not recall any reference to doors breaking at the hinges. We have heard of occasional warping or cracking near the joint between the doors. Your suggestion that breaking is due to back swing hardly seems probable, for a considerable force would have to be exerted at the joint edges to cause the door to swing over 180°.

Possibly the hinge is not designed to be sufficiently strong in relation to the remainder of the door. We suspect that the trouble may be caused by the relation of the hinging to the base plate. If a bending action is placed on the hinge when the doors are propped up, it could cause a small crack which eventually propagates to the point of failure.

As far as steel hinges are concerned, we cannot see any objection so long as they are heavy enough to withstand the load placed on them. The only point is that it requires extra work to make them and to attach them to the door. The same applies to a plate overlaid with cast iron.

We imagine the easiest method of decelerating the swing of the door would be to fix the pin in the base plate and have the pin in turn attached to a spiral spring so that the spring is compressed as the door swings. However, we

(*Concluded on page* 138)

for FAST, EFFICIENT SHAKE-OUT with NO DESTRUCTIVE VIBRATION

One of four Royer Shake-Outs at Lincoln Brass Works, Inc., Detroit.

The walking-beam principle used in the Royer Shake-Out provides rapid, reciprocating action for fast, efficient operation without self-destructive pounding or vibration. Two opposing grids, actuated by motor driven eccentrics, move alternately one within the other. The action of each grid is a rapid up, forward and down motion. Sand, quickly loosened, falls between the grids without arching or clogging. The walking-beam action conveys the castings off the ends of the Shake-Out into a tote box or wheelbarrow.

The Royer is ruggedly built to withstand the service abuse to which a shake-out is subjected. Concentric grids, balanced against each other, minimize shaft and bearing strain. The frame is always stationary . . . no twisting or wrenching motion to shake the Royer apart. Little floor space is required and the low table height reduces lifting.

Used with a Royer Sand Separator and Blender, you will have complete sand conditioning with long life and low maintenance costs. We will be glad to make suggestions on the proper use of Royer equipment in your foundry. Write for information on Royer Shake-Outs in various combinations with conveyors, magnetic separators and Royer Separators.

Export Department, 306 W. Washington Blvd.
Chicago 6, Ill., U.S.A. Cable: ASMAN

Foremost in Sand ROYER *Conditioning Equipment*

ROYER FOUNDRY & MACHINE CO. 159 PRINGLE ST. KINGSTON, PA.

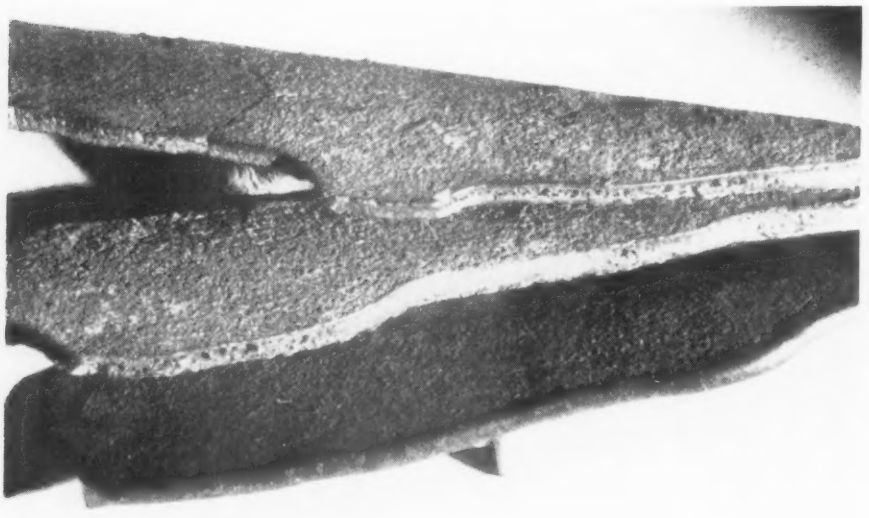
(*Concluded from page* 136)

believe that any means of deceleration would be in the way and cause more trouble than it would be worth.

Defect in Pipe Is Cold Shut

QUESTION We are sending to you pieces of gray iron castings with which we have been having trouble. Streaks appear in these castings, which are made with green sand cores and in green sand molds. Cores are made on a hollow barrel with numerous vents on 2-in. centers.

ANSWER The appearance of the pieces of castings and your mention of the barrel core of green sand indicate that the castings in question are soil pipe. Examination of the various specimens leads us to the opinion that the streaks, as you term them, are cold shuts, and we suspect the cause to be springing or bending of the core.



Sections of pipe casting illustrating appearances of cold shut areas

In every instance the sections in which the cold shuts appear range from 3/32 to ⅛-in. in thickness, compared with 3/16 to ¼-in. thickness an inch or so away. Hence, we suggest you inspect the core barrels to see that they are straight, for if they are bent the sand will be thicker on one side than on the other at the bend. When the cores are placed in the mold, the section with the thicker layer of sand will produce a thinner wall in the casting.

Another possibility is that the fit of the core barrel on the flask is much too loose and that in wedging, the operators put wedges only on the top or the bottom, thus lowering or raising the core. A third possibility is that the core barrels are not heavy enough to provide the necessary rigidity and permit bending through the combination of metal pressure and heat.

Procedure for Cleaning Steel

QUESTION We are making steel castings (SAE 1017) by the investment method using expendable wax patterns. Melting is done with two 32-kw high-frequency induction furnaces. Castings are small with 10 to 40 pieces sprued up in one flask. We melt about 3 to 4 lb steel at a time which is sufficient to fill one flask. We have been bothered with slag on the surface of our castings as well as entrapped gas. What is your recommendation for a deoxidizing procedure to use with this type of melting? Ferrosilicon and aluminum have been tried but perhaps not in the proper amounts or at the correct time in the melting and pouring cycle. Our stock is usually clean and free from oil and scale. Would the recommended procedure work as well for low-carbon alloy steels such as SAE 4620?

ANSWER You do not give much information to go on, but we believe that if you will add enough ferromanganese to bring the Mn content up to 0.60 per cent minimum about 5 minutes before pouring, and at the same time enough 50 per cent ferosilicon to give 0.40 per cent Si in the melt, and then about 2 minutes before pouring add the usual 2 lb Al per ton, you should have good steel. That should take care of the gas.

You must take care of the slag by proper skimming before pouring if you are using the plain induction furnace, and not the type on which the mold is clamped and tipped upside down. In the latter we assume that the steel just gets under the slag as the furnace is tipped and no trouble is encountered. With crucibles, the slag must be skimmed off with a small-diameter bent steel rod. Same practice should be all right for low-alloy steels.

Resisting High Temperatures

QUESTION We have been asked by a customer to supply a heat-resistant gray iron casting to withstand approximately 2200° F, and we are wondering what alloy mix you would recommend. The castings have to be of good quality machinable iron as considerable machine work is done on them by the customer. We are interested in a simple mix that requires little or no analysis process.

ANSWER If your customer expects to obtain an alloy iron which will withstand a temperature of 2200° F continuously, he is unduly optimistic since numerous top-flight research workers still are trying to develop special alloys which will withstand 2000° F for jet engine applications. However, we suspect that the castings he has in mind will not have to undergo such rigorous conditions, and without definite knowledge on the application of the casting, we hesitate to make any suggestions.

It might be pointed out that high-chromium cast irons (22 to 26 per cent Cr) are reported to operate satisfactorily at 1800° F where not subjected to shock, but they are practically unmachinable. Ni-Resist, containing around 14 per cent Ni, 6 per cent Cu, and 2 per cent Cr, is said to withstand temperatures around 1500° F, and is machinable. In our opinion the production of alloy irons without facilities for analysis is rather hazardous since, without them, you cannot know whether too much or too little alloy appears in the castings.

REFRACTORIES— Melting... Cutting Out...?

RUNOUT TROUGHS

CINDER NOTCH LINERS

CINDER NOTCH PLUGS

MOLD PLUGS

BEDS AND TRAYS

SPLASH PLATES

STOOL INSERTS

CORES

SKIMMER PLATES

Stock NATIONAL Carbon Brick and Shapes for Low-Cost Maintenance

TRADE-MARK

"National" carbon blast furnace linings, of course. But HAVE YOU THOUGHT ABOUT CARBON for the other hot-spots where ordinary refractories conk out from high temperatures or slag-cutting? CARBON, the refractory, has no melting point and low affinity to molten metal and dross. In fact, even in *unfavorable* atmospheres, CARBON frequently outperforms other refractories on a length-of-life or cost-of-replacement basis.

Here are some of the places where "National" carbon and graphite can follow up their good work in the furnace...improve production, deflate maintenance cost, increase product quality and better the safety of equipment and personnel.

ON NEW APPLICATIONS OF CARBON, CONSULT NATIONAL CARBON'S ENGINEERS FOR PROPER GRADE AND DESIGN.

The term "National" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

District Sales Offices:
Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

IN CANADA:
National Carbon Limited — Montreal, Toronto, Winnipeg

Men of Industry

WILFRED H. WHITE, for 9 years metallurgist, Jackson Iron & Steel Co., Jackson, O., has acquired Watertown Foundry, Watertown, S. Dak., producer of gray iron castings. Mr. White was graduated from Antioch College and during World War II was chief of the Tungsten Section, Ferro - Alloys Branch, WPB, Washington. Prior to that he was associated with E. I. duPont de Nemours & Co., Buffalo, and Jamestown Malleable Iron Corp., Jamestown, N. Y., in chemical and metallurgical work.

♦ ♦ ♦

Richard Bancroft has been named head of the Castings Division, Perfect Circle Corp., responsible for activities of the foundry in New Castle, Ind. sleeve castings plant in Richmond, Ind., and the Muskegon, Mich., plant. **Karl Effman** has succeeded Mr. Bancroft as head of the engineering division. He was formerly chief research engineer. **Dewey Bookout,** formerly manager of the manufacturing division, has become chief industrial engineer. **Dean Parsons,** who has been supervisor of production planning, heads the machining division's plants in Tipton and Richmond, Ind., and the Hagerstown, Ind. machining plant and warehouse.

♦ ♦ ♦

Raymond Bishop, formerly superintendent of the Rock Island, Ill., works, J. I. Case Co., has been named manager. Mr. Bishop has been associated with the farm machinery manufacturer since 1944.

♦ ♦ ♦

Leonard G. Nelson has been appointed works manager, Youngstown Alloy Casting Corp., Youngstown, O. Mr. Nelson's previous connections include Northwestern Steel & Wire Co., Sterling, Ill., Rustless Iron & Steel Corp., division of Armco Steel, Baltimore, and Ludlow Valve Co., Troy, N. Y.

♦ ♦ ♦

Eads Johnson Jr., since 1951 executive vice president, Southern Wheel Division, American Brake Shoe Co., New York, has been elected division president, succeeding **William F. Cutler** who is retiring after 44 years with the company which his father helped found. Mr. Johnson joined Brake Shoe & Castings Division in 1934 as an apprentice and later became a sales representative, transferring to Southern Wheel Division sales in 1949.

♦ ♦ ♦

Charles J. Rittinger, for 8 years foundry engineer and metallurgist, American Car & Foundry Co., Detroit, has been appointed general manager, Industrial Castings Co., Detroit, owned by Charles A. Brady.

♦ ♦ ♦

C. Cruse Honey, formerly general manager of trackwork operations, Taylor-Wharton Iron & Steel Co., Norwood, O., has been appointed plant manager of the company's manganese steel foundry, High Bridge, N. J. Mr. Honey joined the company following Navy service and has held executive posts at each of its four plants.

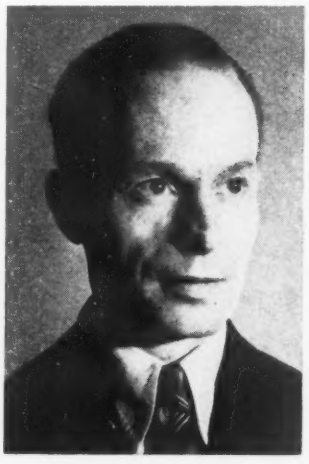
♦ ♦ ♦

Alvin A. Schumann has been elected president, Lehigh Foundries Inc., and its affiliate Lehigh Mfg. Co., Easton, Pa. **Frank E. Schumann,** who has been president since 1927, has become chairman of the board. **Fred C. Krauss,** controller, has been named treasurer.

♦ ♦ ♦

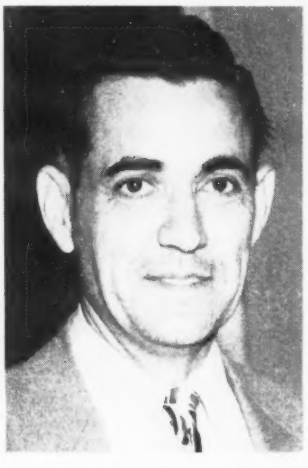
George L. Knight Jr. recently entered the college trainee program, Lynchburg Foundry Co., Lynchburg, Va. Following graduation from Missouri School of Mines and Metallurgy in 1951, Mr. Knight became foundry laboratory technician in the manufacturing research plant, International Harvester Co., Chicago.

(Continued on page 142)



WILFRED H. WHITE
. . . acquires Watertown Foundry

RICHARD BANCROFT
. . . heads castings division

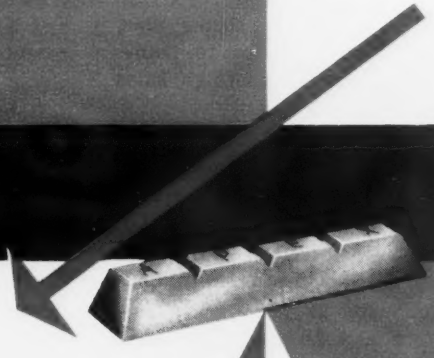


RAYMOND BISHOP
. . . plant mgr., J. I. Case Co.

LEONARD G. NELSON
. . . Youngstown Alloy works mgr.

call on APEX

. . for scientifically controlled alloy ingot of superior quality ...products to meet your casting requirements



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Research leadership back of every ingot

30th Anniversary Year

APEX SMELTING COMPANY

CHICAGO · CLEVELAND

LOS ANGELES

CHARLES KATES
. . . pres., Union Malleable Mfg.

C. H. WILLIS
. . . Union Malleable V. P.

D. E. GILMAN
. . . Ashland Malleable executive

HOMER SIPE
. . . Union Malleable treasurer

(*Continued from page* 140)

Sol Jacobson, due to ill health has resigned as president, the Union Malleable Mfg. Co. and its subsidiaries, Ashland Malleable Iron Co. and Union Brass & Copper Co., Ashland, O. In 1951 he succeeded his brother, the late Jack Jacobson, as president. **Charles Kates** is the new president-general manager of the parent company and subsidiaries. He has been with the company 8 years and sales manager for a year. **C. H. Willis,** with the company 25 years, and formerly works manager, has become vice president-assistant general manager of Union Malleable. **D. E. Gilman,** who joined the company in 1948, and has been works manager, Ashland Malleable Iron Co., has been named vice president-assistant general manager of that branch. **Homer Sipe,** with the company 5 years, has become treasurer and comptroller of the three plants, and **Robert L. Fasig,** 13 years with Union, has been appointed director of purchases for all plants.

♦ ♦ ♦

J. Louis Reiber, vice president, Republic Coal & Coke Co., Chicago, has been appointed southwest sales manager with offices in St. Louis.

♦ ♦ ♦

Erhardt C. Koerper has been appointed works manager, Ampco Metal Inc., Milwaukee, producer of sand and centrifugally cast and extruded aluminum bronze alloys. For 9 years Mr. Koerper was assistant executive engineer, A. O. Smith Corp., Milwaukee.

♦ ♦ ♦

N. George Belury, president, Engineered Castings Division, American Brake Shoe Co., New York, has been elected a vice president of the company. Mr. Belury joined Brake Shoe following graduation from Purdue University in 1937 and was in the sales department of the Brake Shoe & Castings Division prior to transferring to engineered castings sales in 1947.

ROBERT L. FASIG
. . . p. a., Union Malleable

♦ ♦ ♦

Edwin H. Walker has been named president-general manager, McKinnon Industries Ltd., subsidiary, General Motors, St. Catharines, Ont. He succeeds **Thomas J. Cook,** who has retired following 28 years with General Motors and 10 years as president-general manager of McKinnon.

♦ ♦ ♦

George J. Leroux who retired early this year as assistant manager, Cleveland Works, National Malleable Steel & Castings Co., following 50 years of service, has established residence in Venice, Fla., where he plans to build a permanent home.

♦ ♦ ♦

Norman F. Tisdale, manager of sales, Molybdenum Corp. of America, was honored by Queen's University, Kingston, Ont., on May 16, with the honorary degree of Doctor of Laws. After graduating from Queen's University in 1919, with degrees in chemical and metallurgical engineering, Mr. Tisdale became interested in development and sale of alloying elements in production of ferrous and nonferrous metals and has been active in development of boron applications in steel and iron. In 1950 he organized an advisory council for engineering at his alma mater and is currently its chairman.

♦ ♦ ♦

Harold J. Dawe has been appointed technical director, Acheson Colloids Co., Division of Acheson Industries Inc., Port Huron, Mich., and will be responsible for research and development activities. **Alden Crankshaw,** since 1941 eastern service manager, has been named sales manager for the company. His former New York and New Jersey territory is now represented by **Paul E. Yoder.**

♦ ♦ ♦

Robert L. Werkheiser has been named representative in Chicago, Minnesota and Wisconsin, industrial resins sales department, Monsanto Chemical Co., Springfield, Mass. A graduate of Carthage College, Mr. Werkheiser was a research chemist with Interlake Chemical Co., Chicago, until 1949, when he joined Monsanto's plastics division research department.

♦ ♦ ♦

Morton O. Withey, dean of the college of engineering, University of Wisconsin, will retire this summer. Dean Withey has been a faculty member 48 years.

♦ ♦ ♦

Robert Lange, formerly Washington office manager, Hyster Co., Portland, Oreg., has been named east-central district manager, including the Washington office. **Arthur Morris,** who joined Hyster Co. last year, has been made north-central district

(*Continued on page* 144)

A REVOLUTION IN FERROUS MELTING PRACTICE

The first of its type to be used in production ferrous melting in this country . . . . .

Tapping one of the AJAX furnaces. Metal runs by gravity into a bull ladle. About 400 lbs. are poured at a time.

AJAX-WYATT ELECTRIC FURNACE

low frequency induction melting for malleable and gray iron castings performs easily and economically.

The single-phase, 525-550 V. low frequency AJAX-WYATT furnaces at 350-400 KW capacity installed at I. F. Sales Co., Inc., for malleable melting, holding, superheating or duplexing give these results.

Estimated cost per ton of melt based on operation 24 hours per day, five days a week, and with total power cost of 1c per kwhr. (Costs vary slightly with local conditions.)

Power	$5.00	to $5.50
Holdover Power	.48	.48
Labor	2.60	2.60
Refractory	1.75	1.75
Total	$9.83	$10.33

These furnaces run 24 hours a day, six days a week. Over weekends standby settings are switched on and current consumption is set and held so that imput balances heat losses. Charge losses are negligible and are found not to exceed 0.200% carbon. Slag is skimmed off only once a week. If power fails metal remains molten for about three hours.

Relining can be done by two men in about 14 hours, and drying in three days by gas flame. When the furnace is used for melting a lining life is approximately three months, with furnace operating 24 hours a day, six days a week.

AJAX-WYATT FURNACES PRODUCE QUALITY GRAY IRON AND GIVE THE CHOICE OF MELTING ALLOY IRON CASTINGS, THEREBY OPENING UP A WIDER FIELD FOR FOUNDRYMEN.

We invite your questions regarding the AJAX-WYATT electric furnace revolutionary method of ferrous metal melting.

AJAX ELECTRIC FURNACE CORPORATION

1108 FRANKFORD AVE., PHILADELPHIA 25, PA.

Associated Companies: *AJAX Electro Metallurgical Corporation.* *AJAX Electric Co., Inc.* *AJAX Electrothermic Corp.* *AJAX Engineering Corp.*

(*Continued from page* 142)
manager, including eastern Canada. **Walter St. Clair,** until recently Hyster national account representative in Chicago, has been assigned the mid-central district and **Robert Hile,** the northwest district, following retail and general sales work in the Peoria, Ill., factory. **J. W. Morgan,** for the past year a field district manager, has been appointed assistant sales manager of the eastern industrial truck sales division with headquarters in the Danville, Ill., plant.

♦ ♦ ♦

Dan Stearns has been appointed manager with headquarters in Chicago, of the midwestern region recently created by Clark Equipment Co.'s Industrial Truck Division, Battle Creek, Mich. **Glen R. Johnson,** for 6 years national account representative, has been named assistant regional manager. Mr. Stearns succeeds **A. G. Morrison** who has been appointed Clark dealer in western Michigan.

♦ ♦ ♦

E. H. Horstkotte has been appointed engineering consultant, Michigan Oven Co., Detroit, with headquarters at 1554 Union St., Schenectady, N. Y. Mr. Horstkotte has been associated with General Electric Co. for 40 years, at first in application and development of equipment used in the paper, cement, woodworking and steel furnace industries, and for the last 20 years as engineer of the company's works laboratory in Erie, Pa.

♦ ♦ ♦

Thomas D. Cartledge, for the past year president, Linde Air Products Co., has been elected vice president of the parent company, Union Carbide & Carbon Corp., New York. Mr. Cartledge became a Cleveland territory salesman for Linde following World War I, was sent to the general sales management staff in New York during 1925, became vice president in 1940 and senior vice president 4 years later.

♦ ♦ ♦

Thomas J. McNaughtan, formerly assistant director of research, Durez Plastics & Chemicals Inc., laboratories, Leroy, N. Y., has joined Borden Co.'s Chemical Division as development manager at its laboratory recently completed in Philadelphia.

♦ ♦ ♦

Earl G. Berwick, Manning Otis, and **Lorne H. Hay** have been appointed field engineers in Toronto, Canada, for Bellows Pneumatic Devices of Canada Ltd., subsidiary of the Bellows Co., Akron, O. **Henry E. Hall** has been appointed field engineer in Montreal, Que.

♦ ♦ ♦

Charles J. Guimbarda, formerly project engineer at the Navy's jet engine plant Detroit, has joined Laclede Arch Co., subsidiary of Laclede-Christy Co., St. Louis, as design engineer. **James W. Bennett** has been appointed design engineer in the St. Louis office of Laclede Arch Co.

♦ ♦ ♦

Thomas P. Kennedy has been appointed purchasing agent, Haas Foundry Co., Racine, Wis. He was formerly director of the county pension department in Racine.

♦ ♦ ♦

Orin W. Potter, associate professor, Engineering School, University of Minnesota, has been named a full professor. Mr. Potter has conducted a foundry materials sales-service business for many years in the Minnesota area, representing Carpenter Bros. Inc., Milwaukee; Electro Refractories & Abrasives Corp., Buffalo, and Ironton Firebrick Co., Ironton, O. Prof. Potter was graduated from University of Minnesota where he received his master's degree in 1925, and is a former chairman of the Twin City Chapter of the American Foundrymen's Society. His son, Weston M. Potter, is associated with him in his foundry business.

♦ ♦ ♦

D. E. Dallman, assistant district manager, has been appointed Minneapolis district manager, Air Reduction Sales Co., New York, succeeding the late M. M. Weist who was associated with the company 35 years. Mr. Dallman joined Air Reduction 18 years ago and was previously eastern railroad sales manager.

♦ ♦ ♦

Mathias E. Szeyller has been appointed sales engineer in northern Ohio for A. J. Gates Co., Baker-Raulang representative in northern Ohio. In 1948 Mr. Szeyller became sales engineer in Ohio for Electric Storage Battery Co., Philadelphia, following graduation from Pennsylvania State College.

♦ ♦ ♦

Fred Osborne has been elected vice president, United States Pipe & Foundry Co., Burlington, N. J. A graduate of Clemson College, Mr. Osborne joined Sloss-Sheffield Steel & Iron Co., Birmingham, in 1926. He was named president-director of the company last April and six months later became president of the Sloss-Sheffield Division when it merged with U. S. Pipe.

♦ ♦ ♦

John R. McVeigh, for 3 years research engineer, Kennametal Inc., Latrobe, Pa., has joined the research and development staff, Alloy Engineering & Casting Co., Champaign, Ill. As chief engineer Mr. McVeigh will handle all armed services re-

(*Continued on page* 146)

THOMAS D. CARTLEDGE
. . . v. p., Union Carbide

ORIN W. POTTER
. . . professor, Minnesota U.

FRED OSBORNE
. . . v. p., U. S. Pipe & Foundry

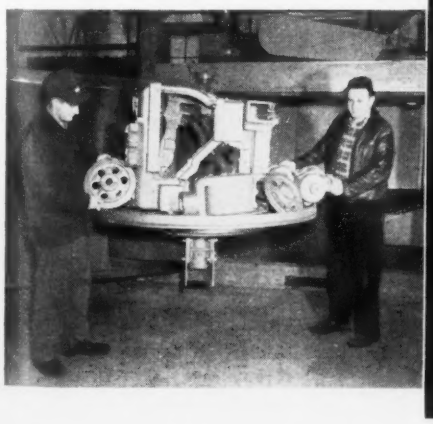
JOHN R. McVEIGH
. . . joins Alloy Engineering

HOW BIG MUST A FOUNDRY BE TO PROFIT FROM WHEELABRATOR® CLEANING?

No foundry is too small to save with the Airless Wheelabrator. Many foundry owners, who once believed their tonnage too small to justify its use, now say they could not operate without their Wheelabrator. They have discovered it saves time and speeds production — makes their prices and quality of cleaning more competitive — makes profitable job cleaning possible — creates new sales opportunities and its overall savings are usually sufficient to amortize entire investment in from six to 18 months.

TWO MOLDER SHOP *Triples Production Increases Sales*

The M & H Foundry, Neponset, Mass., consisting of the two owners and two helpers, are able to triple production with their Wheelabrator. An 8 hour cleaning job has been reduced to less than one hour's time.

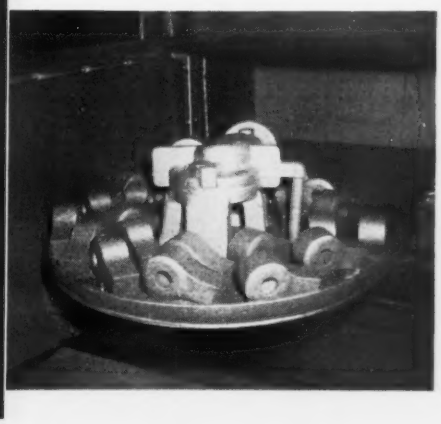


saves $7.06 per ton CLEANING 550 tons ANNUALLY

Keystone Brass Co. replaced a wet blast mill with a Wheelabrator Tumblast and cut labor requirements 7 manhours daily. It cut cleaning costs 67% and saved its cost in approximately a year.

saves 18 manhours per ton CLEANING 43 tons MONTHLY

Installation of a Wheelabrator Swing Table in a Canadian steel foundry eliminated the labor of 4 chippers and grinders and saved $4,644.00 yearly cleaning only 43 tons per month. New business has resulted.



"Small Foundries, Too, Save Money with Wheelabrator". A bulletin of this title shows how it can be done. Ask for Bulletin No. 874.

American

WHEELABRATOR & EQUIPMENT CORP.

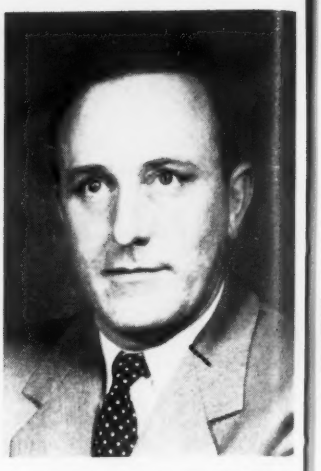
505 S. Byrkit St., Mishawaka, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

R. B. WARREN
. . . dept. mgr., Goodyear Tire

L. W. ADAMS
. . . southern sales, Goodyear

EDWARD O. FALBERG
. . . metallurgy, Bohn Aluminum



DR. GERALD V. KINGSLEY
. . . research, Bohn Aluminum

(*Continued from page* 144)
search and development projects for the company. He was previously project engineer, Continental Aviation & Engineering Corp., Detroit.

♦ ♦ ♦

R. B. Warren has been named manager of industrial products departments, Goodyear Tire & Rubber Co., Akron, O. Mr. Warren joined Goodyear in 1927, and recently was southern sales manager. **L. W. Adams,** who has succeeded Mr. Warren as southern sales manager, joined the company in 1943, and since 1949 has been Pittsburgh district manager.

♦ ♦ ♦

Lyle L. Clark, formerly assistant superintendent of melting, Buick Motor Division foundry, Flint, Mich., has been named supervisor of the foundry section, Armour Research Foundation, Illinois Institute of Technology. **C. Robert Lillie,** previously project engineer, Standard Oil Co. of Indiana, and **Jack Giddens,** who has been chief metallurgist, Perfect Circle Co., Richmond, Ind., have been appointed research metallurgists. Mr. Clark joined Buick Motor Division in 1935 following graduation from Michigan State College. Mr. Lillie, an alumnus of Purdue University, was formerly associated with National Research Council, Washington, and Carnegie-Illinois Steel Corp., Pittsburgh, and Gary, Ind. Mr. Giddens, a graduate of Tri-State College, previously worked for C. & G. Pattern Shop, Indianapolis, Wells Mfg. Co., Skokie, Ill., and International-Harvester Co., Indianapolis.

♦ ♦ ♦

Charles H. Evans, superintendent, and **Paul H. Magnus II,** assistant superintendent, Rosedale Foundry & Machine Co., Pittsburgh, have been named vice presidents. Mr. Evans has been with Rosedale 44 years and Mr. Magnus joined the company 4 years ago.

♦ ♦ ♦

Gifford Kittredge, formerly Chicago regional field engineer, Lamson Corp., Syracuse, N. Y., has been appointed New York regional manager including Philadelphia and Baltimore districts.

Dr. Gerald V. Kingsley has been named research supervisor and **Edward O. Falberg,** production metallurgy supervisor, Bohn Aluminum & Brass Corp., Detroit, as assistants to W. E. McCullough, chief metallurgist. Dr. Kingsley has been associated with Bohn Aluminum 12 years and Mr. Falberg joined the company 4 years ago.

♦ ♦ ♦

Grant S. Diamond, president, Electro Refractories & Abrasives Corp., has been appointed to the graphite panel of the Minerals and Metals Advisory Board, National Academy of Sciences, National Research Council, Washington.

♦ ♦ ♦

Adrian J. Archambault has been named Michigan representative for Buckeye Products Co., Cincinnati, foundry facings, core oils, flask fittings and refractory cements. He succeeds **Howard B. Voorhees,** who will confine his activities to the Indiana territory with headquarters in

(*Concluded on page* 148)

LYLE L. CLARK
. . . Armour supervisor

JACK GIDDENS
. . . Armour metallurgist

C. ROBERT LILLIE
. . . joins Armour Research

ADRIAN J. ARCHAMBAULT
. . . Buckeye sales, Michigan

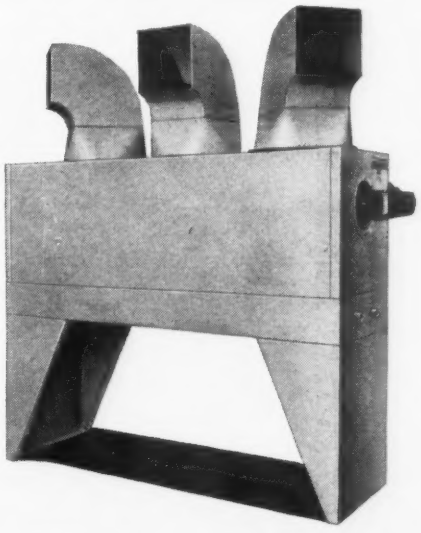
DON'T LET WINTER ROB YOU OF PROFITS!

ADVANCE WEATHER FORECAST
Mercury to Drop to Zero.
COLD GRIPS CITY

NOW'S THE TIME TO INSTALL "Buffalo" UNIT HEATERS

"Buffalo" Breezo-Fin Heaters deliver comfortable heat in small areas and operate economically on as little as 2 lbs. steam. Available in 20 sizes; have high - quality Aerofin heater element for maximum radiation and "Buffalo" Breezo Fan to throw heat positively. Write for Bulletin 3137.

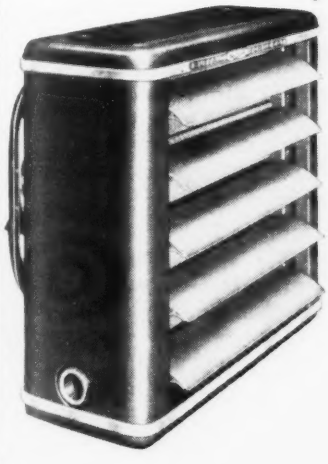
Winter can put the "chill" on your plant and people, cutting down production, efficiency, and profits! Why take the chance? "Buffalo" Unit Heaters warm up hard-to-heat corners and areas — at low cost. Compact "Buffalo" heaters are easily and quickly installed. So right now, while it's hot, make sure it's warm in your plant next winter!—Install "Buffalo" Unit Heaters!



HIGHBOY

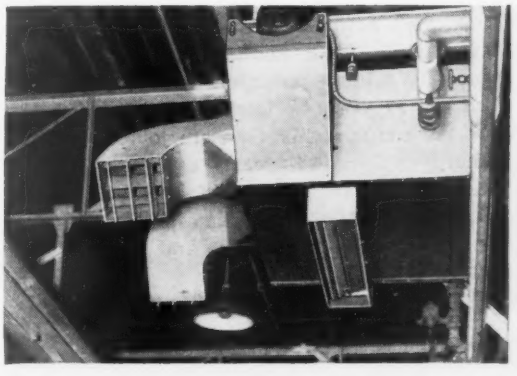
The Highboy is ideal for heating that "new addition" or any large area.

Highboy is easily adapted to your present heating system, since it has adjustable outlets for duct connections and louvers. Unit pictured has "Buffalo" non - corrosive Aerofin heater element and mixed-flow fans on hollow shaft. "Buffalo" can supply arrangements and combinations tailored exactly to your individual needs.
Write today for Bulletin 3704.



NO WASTED FLOOR SPACE WITH LOW-BOY!

This suspended model supplies fresh, warm, filtered air to an entire room. In addition to its high-efficiency non-corrosive Aerofin heater element, it has "Buffalo" mixed flow fans on hollow shaft. When used as a window installation, it supplies makeup air for plants using large capacity exhaust systems.



FIRST FOR FANS

BUFFALO FORGE COMPANY

221 MORTIMER ST. BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING FORCED DRAFT | AIR CLEANING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT PRESSURE BLOWING | EXHAUSTING

(*Concluded from page* 146)

Mishawaka. Mr. Archambault, recently engaged in foundry supplies sales, at one time was associated with Grede Foundries Inc., Milwaukee, and later was in charge of the foundry department, Hackley Manual Training School, Muskegon, Mich.

♦ ♦ ♦

H. H. Morgan has been named president, and **W. J. Bongard,** vice president, Robert W. Hunt Co., Chicago, engineers. **L. H. Stott,** vice president, **S. C. Sexauer,** secretary and **W. F. Anderson,** treasurer, are the other officers.

♦ ♦ ♦

Alvin Trefethen has been appointed head of conveyor division operations, Richards-Wilcox Mfg. Co., Aurora, Ill., succeeding **Elmer R. Ransom,** vice president, who has been named vice president-marketing. Mr. Trefethen has been manager of conveyor and folding partition sales for 12 of the 17 years he has been in the New York office. Mr. Ransom joined Richards-Wilcox 17 years ago and was assistant manager of Cleveland district until 1948 when he became the conveyor division's sales and production manager.

ELMER R. RANSOM
. . . v. p., Richards-Wilcox

ALVIN TREFETHEN
. . . conveyor division head

EDWARD W. LEGIER
. . . v. p., American Blower

VINCENT J. DOYLE
. . . joins Lebanon Steel Foundry

♦ ♦ ♦

Francis B. Herlihy, formerly assistant chief metallurgist, has been appointed chief metallurgist in American Brake Shoe Co.'s research laboratories, Mahwah, N. J. He joined the company in 1945 following graduation from Massachusetts Institute of Technology.

♦ ♦ ♦

Dr. Walter R. Hibbard Jr., since 1952 assistant manager of the materials and processes section, Research Laboratory, General Electric, Schenectady, N. Y., has been appointed manager of the alloy studies section recently established in the metallurgy department of General Electric's research laboratory, Schenectady, N. Y. A graduate of Wesleyan University, Dr. Hibbard received his doctorate in engineering in 1942 from Yale University where he taught metallurgy following Navy service in World War II. He joined the G. E. research laboratory in 1951.

♦ ♦ ♦

Edward W. Legier, since 1933 eastern division sales manager, American Blower Corp., Detroit, has been elected a company vice president. Mr. Legier joined the company's Chicago office as sales engineer in 1921, and two years later became St. Louis office manager. He was manager of the New York office industrial department from 1926 to 1933.

J. M. Davis, president-general manager, Union Die Casting Co. Ltd., Los Angeles, has resigned, following 23 years with the company. Mr. Davis will serve as special consultant to the board of directors. **Walter H. Bodle** has been named president-general manager.

♦ ♦ ♦

Edward H. Berry was recently appointed foundry manager-chief metallurgist and **Henry J. Kelly,** chief engineer, Dodge Steel Co., Philadelphia.

♦ ♦ ♦

George Staub has joined Alloys & Products Inc., New York, as sales representative for metropolitan New York. Until recently Mr. Staub was owner of American Marine Brass Foundry, Brooklyn, N. Y. He is executive secretary, Metropolitan Brass Founders' Association, and last year was a director of the Metropolitan Chapter of the AFS and a member of its educational, advisory and membership committees. He is also on the advisory board of the AFS Student Chapter, Polytechnic Institute of Brooklyn.

♦ ♦ ♦

John L. Goheen has been appointed district manager for commercial research on the West Coast, American Brake Shoe Co., New York, with headquarters in the San Francisco office. Mr. Goheen, a graduate of Wooster College, joined the company as a research metallurgist in 1943. He served in the metallurgical research laboratories until 1950 when he was transferred to market research and development work.

♦ ♦ ♦

Vincent J. Doyle has been named sales representative, Lebanon Steel Foundry, Lebanon, Pa., at the Canadian office recently opened by the company at 1411 Crescent St., Montreal, Que. Until recently Mr. Doyle was associated with Sorel Industries Ltd., Sorel, Que. Prior to that he was with Otis Elevator Co., Hamilton, Ont., and Industrial Engineering Ltd., Vancouver, B. C.

♦ ♦ ♦

R. C. Smith has been appointed field engineer in the Rochester, N. Y., district, the Bellows Co., Akron, O. **Aaron I. Kutz** has been assigned to the New York office and **Robert E. McClure** will be located in the Boston territory.

♦ ♦ ♦

Charles J. Weedon, president, North American Dye Corp., Mt. Vernon, N. Y., has joined the New York office of Lester B. Knight & Associates, Chicago.

♦ ♦ ♦

F. C. Morey, Cleveland foundry engineer, has joined the Dracco Corp., Cleveland. He will work with the sales and engineering departments.

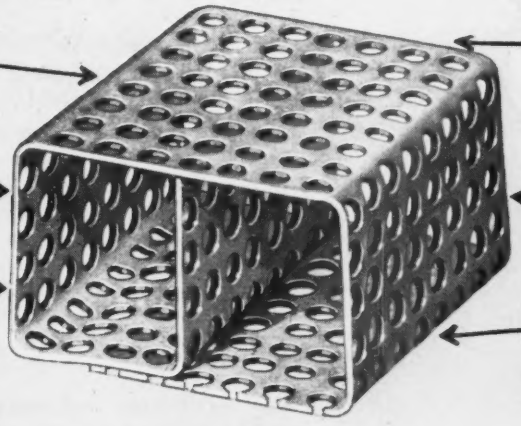
the perfect COMBINATION → of SHAPE and SIZE → for LIGHT CORE castings

fine FANNER perforated chaplets

PERFORATIONS
Large number of perforations in light metal insure perfect fusion in light castings.

LARGE SUPPORT AREA
Widely distributed support area holds core more securely in place.

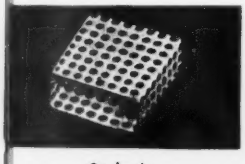
FLEXIBLE SHAPE
Made in 10 styles in any shape or contour required, flat, or curved to any radius, wedge-shape, bridged or with extended ends.



WILL NOT CHILL
Because of the large perforated area, there is no concentration of metal at any point to chill and cause leaks.

ACCURATELY MADE
Produced to exacting standards on specially designed machines to meet specifications.

PERFECT VENT
There are no gas or air pockets to cause "blow holes", so that perfect ventilation is secured.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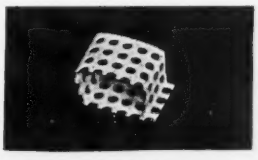
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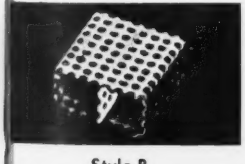
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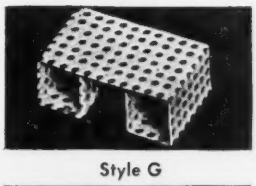
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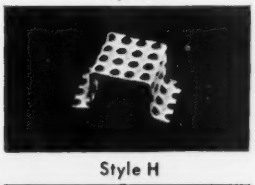
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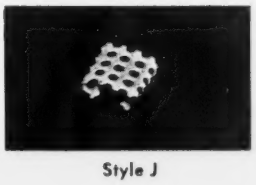

Style J

● Here is the most versatile of chaplets for light core work. Gives you the exact features you want to fit your particular need—the right shape, the right size, the right construction, the right material. Fine Fanner Perforated Chaplets are ideally suited to a wide variety of applications where there is no need for heavy core support. Made of tin coated sheet steel for ferrous castings—of aluminum, copper or brass for use in castings of these metals. The perforated design offers a great number of advantages; more perfect fusion in light sections, perfect ventilation eliminates pockets that cause "blow holes", there is no concentration of metal at any point to chill and result in leaks. Wide support area holds core securely. Shape can be designed to fit almost any contour. They are available in a large number of types, some of which are illustrated, and an extremely wide range of thicknesses and sizes. Get acquainted with fine Fanner Perforated Chaplets by sending for a free copy of the Fanner Chaplet Catalog today.

THE FANNER MANUFACTURING CO.

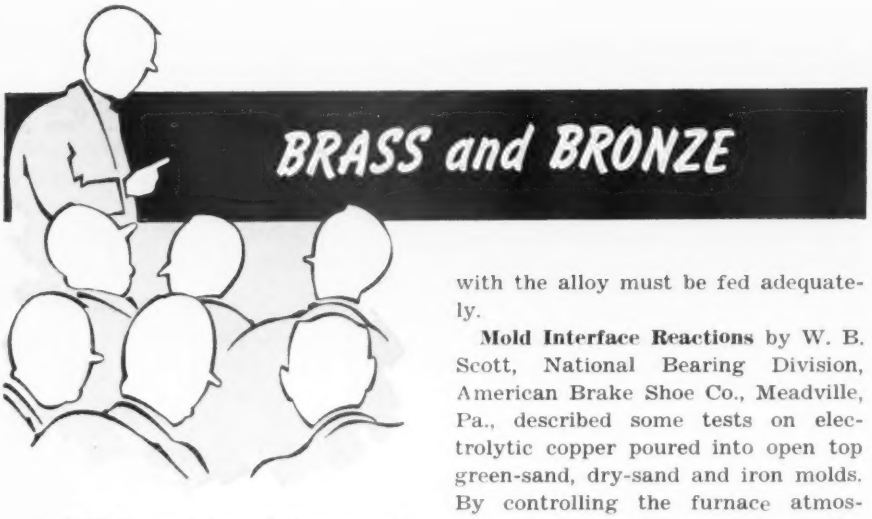
Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

(*Continued from page* 107)

Speaking on "Coremaking Machines," L. B. Koenig, J. I. Case Co., Racine, Wis., traced the tremendous changes that have taken place in coreroom practice and the machines utilized in producing cores. Today semiautomatic and automatic machines handle the sand from storage through the mixers and to the hoppers at the machine stations. All operations and ingredients are controlled.

The second portion of the program was a film, "Mechanization in Coremaking," prepared by the Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, for the AFS Plant and Equipment Committee. The film was introduced by H. C. Weimer of Beardsley & Piper. It will be available for group showings.



A WIDE variety of brass and bronze foundry phases were discussed in three technical sessions and a roundtable luncheon. These included mold interface reactions, casting defects, metal penetration, fracture testing, segregation, macroporosity and fluid flow.

First session chairmen were F. L. Riddell, H. Kramer & Co., Chicago, and J. G. Dick, Canadian Bronze Co. Ltd., Montreal.

Properties of Graphite Nickel Alloy Castings by J. T. Eash and G. L. Lee, International Nickel Co. Inc., Bayonne, N. J., was presented by Mr. Lee. Alloy discussed containing 1 to 1.5 per cent C, 2 per cent Si, 1.5 per cent Mn, 0.05 to 0.15 per cent Mg in excess of S content, and remainder Ni, is said to possess such attributes as excellent corrosion resistance, good fluidity, sharp definition, free machining, excellent galling resistance, and extremely low galvanic action with other metals and alloys. Tensile strength is 55,000 to 60,000 psi, yield strength 25,000 psi average, and the alloy has 20 to 25 per cent elongation.

In the discussion it was pointed out that the new alloy has a fracture somewhat like gray iron and different from S monel metal in that it was practically all nickel instead of containing copper as does monel. It has a lower contraction shrinkage than S monel, but pattern shrinkage is about the same. Castings made with the alloy must be fed adequately.

Mold Interface Reactions by W. B. Scott, National Bearing Division, American Brake Shoe Co., Meadville, Pa., described some tests on electrolytic copper poured into open top green-sand, dry-sand and iron molds. By controlling the furnace atmosphere during melting—and hence the amount of gas picked up by the metal—a level, puffed-up or pipe-shrink condition could be obtained on the top surfaces of the resulting castings.

Effect of Casting Defects on Physical Properties by B. N. Ames, New York Naval Shipyard, Brooklyn, pointed out that in 6 x 8 x 1-in. gun metal plates cast for developing radiographic standards, an increase in spherical gas porosity or macroporosity, caused a decrease in elongation values. No correlation could be found between pressure test and radiographic appearance, and apparently it was the amount of microshrinkage which determined whether or not the casting would withstand pressure.

Metal Penetration in Cores by R. B. Fischer, Ingersoll-Rand Co., Phillipsburg, N. J., described difficulties encountered with oil-bonded cores in heavy-sectioned castings. Sand used was 60 grain AFS fineness, and trouble was reduced considerably by a combination of that sand plus zircon sand of about 110 AFS fineness. Other molding mediums which were suitable, but had the disadvantage of higher cost, included chrome ore and aluminum oxide.

Manganese Bronze Test Bars, by R. A. Colton, Federated Metals Division, American Smelting & Refining Co., Barber, N. J., presented some values on physical properties of test bars cut from ingots, from keel blocks cast in green sand and from bars cast in iron molds. Test bars from ingots showed tensile strength of 74,800 psi, yield strength of 27,700 psi and elongation of 36.5 per cent. Those from a cast iron mold had a tensile strength of 73,000 psi, yield strength of 26,500 psi, and an elongation of 34 per cent. Keel block bars cast in sand gave a tensile strength of 70,000 psi, a yield strength of 25,000 psi, and an elongation of 20 per cent.

Program of the second session, with W. M. Ball, Jr., Lavin & Sons, Cincinnati, and F. L. Riddell, H. Kramer & Co., Chicago, presiding, comprised a **Fracture Test Symposium.** B. N. Ames, New York Naval Shipyard, Brooklyn, pointed out that the fracture test bar developed at the University of Michigan, under sponsorship of the AFS, related only to determination of metal quality before it was poured into the mold. The bar or plate is 3 x 6 x ¾-in. and is made in a dry sand core set upon a cast iron chill. A dry sand basin containing two 5/16-in. holes is used in pouring. Mr. Ames stated that in order to obtain satisfactory melt quality, it was necessary to give close attention to melting operations to see that the metal was melted rapidly and free from gas.

C. A. Robeck, Gibson & Kirk Co., Baltimore, stated that the fracture test is being used regularly in his foundry with extremely beneficial results. Metal which does not show proper fracture is subjected to suitable treatment to bring it to the desired condition.

Third session, under the chairmanship of W. B. Scott, National Bearing Division, American Brake Shoe Co., Meadville, Pa., and R. A. Colton, Federated Metals Division, American Smelting & Refining Co., Barber, N. J., dealt with segregation and porosity.

Study in Segregation in Bronze Using a Radioactive Technique by W. C. Winegard, University of Toronto, Toronto, Ont., described application of a small amount of radioactive tin to study inverse segregation in tin bronze. Small castings were made in an iron mold, a ceramic mold, and a hot ceramic mold. Autoradiographs of sectioned specimens showed location of the tin.

In the iron mold the tin was distributed fairly uniformly because rapid cooling prevented formation of columnar structure. In the ceramic mold where cooling was slow, per-

(*Continued on page* 152)

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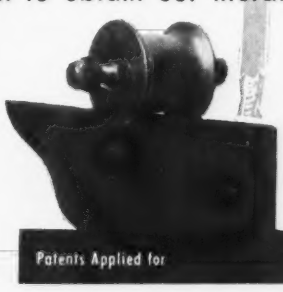
"We got tired of hearing about the high cost of mechanization"...

. . . so we DID something about it. We now manufacture a Conveyor which any foundry — large or small — can afford to buy. WHY?? Our answer to the problem is . . . SIMPLICITY OF DESIGN ! ! !

Our construction finds a parallel in the principle of mounting railroad cars on wheels. No doubt you've marveled at the smooth riding comfort of the streamliners time and again. Although, "comfort" isn't a consideration in moving molds out of your production area—**a smooth ride is essential.** This, we can **guarantee!** You buy "no vibration" insurance when you decide in favor of our sturdy conveyor track and rigid aluminum bottom boards.

Our highly skilled engineers design NOMAD CONVEYOR SYSTEMS to meet each foundry's specific needs.

If you are in the market for conveyor equipment postpone reaching a decision long enough to obtain our literature.



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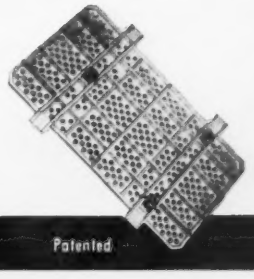

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(*Continued from page* 150)
mitting development of strong columnar growth, the greater portion of the tin was in the outer zones of the casting. With a hot ceramic mold arranged to cool from the top down, the tin was in the top section. Indications are that columnar growth draws the tin from the molten interior to fill in the interstices between the columnar dendrites.

In the discussion a question was asked on how to eliminate inverse segregation and Mr. Winegard suggested increasing the temperature gradient and developing fine grain size. However, for pressure-resisting castings where columnar structure appears to be a desirable condition, a compromise must be made between fine or equiaxed structure and the coarse columnar structure.

Some Factors Affecting Spherical Type Macro Gas Porosity in 85-5-5-5 Bronze by R. B. Fischer, Ingersoll-Rand Co, Phillipsburg, N. J., was concerned with producing heavy-section castings made in dry sand core molds free from small gas holes. The author described in detail numerous materials tried out to eliminate the trouble, and with oil-bonded sand use of graphite coatings containing pitch and a special coating of zircon filler in a resin volatile vehicle inhibited or reduced the gas porosity, but gave poorer surfaces. Cement - bonded, natural-bonded sands, and pitch-bonded sands showed no spherical type macroporosity.

E. F. Tibbits, Wollaston Brass & Aluminum Foundry Co., North Quincy, Mass., said that he found a wash composed of zircon, bentonite and molasses water helped to eliminate gas porosity. Mr. Fischer said he had no success with inert materials, and believed a reducing atmosphere in the mold cavity developed by pitch to be necessary.

Clyde Frear, Bureau of Ships, Washington, suggested that entrapment of air when pouring down the sprue might be a factor in promoting gas holes, but Mr. Fischer stated that under the same conditions of gating, pitch inhibited the formation of the gas holes.

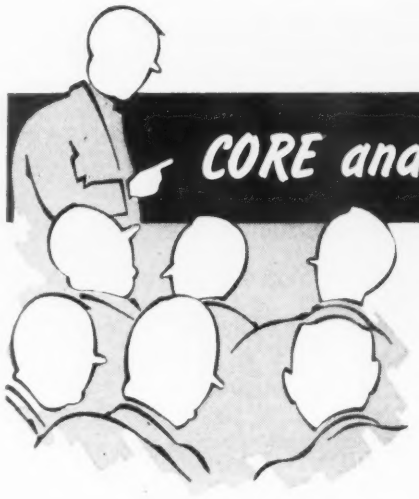
Roundtable luncheon, with B. A. Miller, Baldwin-Lima-Hamilton Corp., Philadelphia, presiding, had an excellent turnout. Those in attendance saw a colored motion picture, **A Brief Study of Fluid Flow in a Small Cylindrical Casting,** prepared by the Brass & Bronze Ingot Institute, Chicago, which is a progress report on work being conducted at Battelle Memorial Institute, Columbus, O.

Using Lucite molds and water, the flow in the usual gating procedure for small castings was shown. In that method a straight sprue leading to a runner is employed, and gates to the castings lead from the bottom of the runner as well as in a direction opposite to the metal flow. Considerable turbulence is developed. A new procedure shown, which practically eliminates turbulence, employs a conical sprue with gates to the castings in the direction of flow. However, it is pointed out that this work is only preliminary and considerably more must be done before any recommendations are forthcoming.

It was pointed out that in the previous technical sessions gating was shown to be important in obtaining sound castings, but every other phase of alloy composition, melting and molding also must be performed properly. Neglect of any one of these factors will nullify the effective functioning of the others.

Several speakers stated that pressure-resisting castings can be produced in aluminum bronze and manganese bronze. Essential feature is good gating to eliminate turbulence which will result in oxide inclusions in those alloys.

While it is possible to melt brasses and bronzes without use of oxidizers, deoxidizers, fluxes and covers, there often is need for those materials, especially when careful control is not practiced. Important thing is to know what condition requires correction so that the proper material is employed. For example, where metal is melted under reducing conditions, copious additions of deoxidizing agents will have no effect. Although phosphor-copper functions as a deoxidizer, it also acts as a fluidizer in copper-base alloys, and its use is advocated for the latter purpose. It also is believed to promote soundness in small pressure-resisting castings such as valves.



CORE and MOLDING SAND

FOUR sessions and two shop courses were conducted by the Sand Division. In addition, a symposium on sand reclamation was sponsored jointly by the Sand, Gray Iron and Steel Divisions.

B. H. Booth, Carpenter Brothers Inc., Milwaukee and Harry W. Dietert, Detroit, presided at the opening sand session at which three papers were presented.

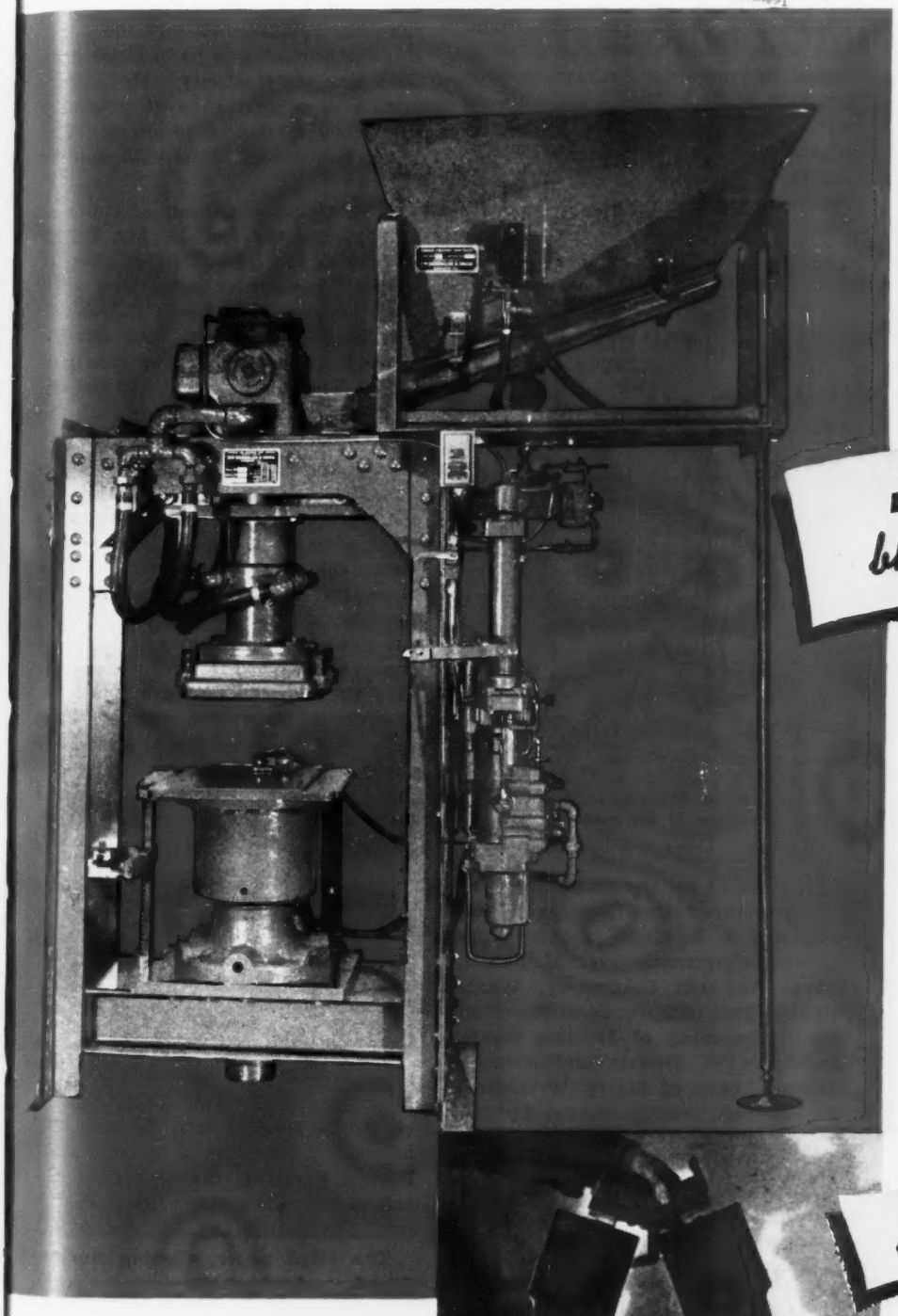
A General Look at Nonferrous Molding Sands, by C. A. Robeck, Gibson & Kirk Co., Baltimore, and C. A. Sanders, American Colloid Co., Chicago, was discussed by Mr. Robeck. While naturally bonded fine-grained sands have been most widely used by nonferrous foundries in the past, the trend toward mechanization has induced many bronze and aluminum foundries to change to synthetic sands. Type of sand the foundry employs should be determined by type of castings produced, according to the authors, who recommend using one base sand and, by blending other sands to it, develop multiple properties for specific uses.

The paper discusses several grades of natural sands, additives used for different purposes in molding sands, and concludes with suggested mixtures for various kinds of nonferrous casting work.

Factors Involved in Making a Sand Mixture was presented by D. F. Baker, its co-author with Prof. D. C. Williams, both of Ohio State University, Columbus, O. It represents a study of the development of green compressive strength in the sand mixture as measured by the electrical energy required to turn a ribbon type mixer. Tests with clay and water mixtures showed a variation in mixing action, distribution of materials, and energy requirements. Water addition to the sand mixture caused a significant increase in energy needed to turn the mixer, although the energy was less when hot water was added to hot sand. Kerosene additions to sand alone cause practically no increase in energy requirements, and a 1 per cent kerosene addition to a sand-water mixture curtails the energy required by water alone.

(*Continued on page* 154)

When the Mechanical Bird was Testing its Wings



Demmler Core Blowers were already first . . . . . . just six years after the Wright Brothers hauled their ungainly "mechanical bird" out of the garage and into a world-shaking flight, Demmler introduced the first successful Core Blowing machine. These "new fangled" gadgets proved themselves by stepping up foundry production and starting a whole new trend in mechanized foundry operations. Today it's the same. The entire industry looks to Demmler for leadership in core blower design.

DOUBLES PRODUCTION
blows any core sand!

The Amazing New Demmler Sleeve Type Magazine

Typical of Demmler's pace-setting design — a sleeve type magazine that will blow ANY core sand without the need for special mixing. And that means sand direct from the foundry sand pile! It will not pack, regardless of moisture content or green strength!

The Demmler 1E-OS, shown at left equipped with the new magazine, is another pace-setter. It can be used with two drag halves so the operator can remove one core while the second core is being blown. It is possible to double production because there is no waiting for the machine. One push of the starting lever and the machine automatically completes one cyle and the magazine returns to filling position!

Here's Proof!

These cores were blown on a Demmler core blower equipped with the new sleeve type magazine. The sand was direct from the foundry's sand pile with a green strength of 7 to 9 pounds. No special mixing was done. Yet these cores will stand unsupported! The hand at left is merely balancing them. The sand is aerated in the magazine by a special process, eliminating any cratering or packing!

Write for literature

WM. DEMMLER & BROS. KEWANEE, ILLINOIS.

(*Continued from page* 152)

Deformation of Green Molding Sand comprised a report by W. G. Parker, Elmira Foundry Co., Elmira, N. Y., chairman of the AFS Sand Division's Deformation Subcommittee. Data were presented on deformation—measured in thousandths of an inch per 2 in.—for a variety of sand specimens, together with their respective sand toughness numbers. The latter represent the deformation figure times the green compressive strength. The test data mark the beginning of a series of studies to note the effect of increasing moisture on physical properties over a range of bond percentages with four different sands. Subsequent work will include other type bonds, various bond combinations, and effect of other additives such as seacoal.

The speaker said that deformation values as part of sand control, give the foundrymen a two-fold test. First is the effect other physical properties have on deformation, thus using deformation as a means to check off-color conditions. Second is the part deformation has in calculating the sand toughness numbers. Once established, sand toughness numbers are the best factor of control.

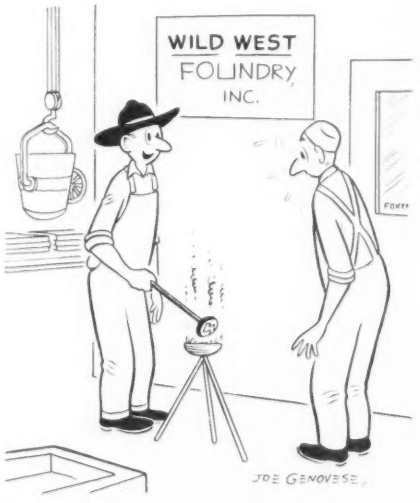
The second sand session, devoted to shell molding materials, had standees in the side aisles. Fred Carl, Fabricast Division, General Motors Corp., Bedford, Ind., and G. P. Phillips, International Harvester Co., Chicago, presided.

Resins and Sands for Shell Molding was presented by F. M. Drumm, Monsanto Chemical Co.'s Plastics Division, Springfield, Mass., who said that the proper choice of a sand and binder determines to a large extent whether the process will be successful and economical. He admitted that cost and availability are important factors in selecting a sand for shell molding, but other considerations can be equally important. These include particle distribution, grain shape and condition of the sand surface.

The speaker warned that use of a cheap sand often requires use of extra large amounts of resin to produce suitable shells.

Attempts to reduce the amount of resin necessary to make satisfactory shells may succeed through one or more of these methods: Thermal coating of sand with thermosetting binders use of alcoholic solutions of conventional binders; use of liquid phenolic resins for sand coatings. Several tests have been developed for evaluating resin-sand mixes. Most useful are the flexural and tensile tests. Once strength properties of a mix are verified by these tests, additional testing for shell thickness, peeling, hot rigidity and packing on vertical surfaces is recommended.

The second paper, **Progress Report, Shell Molding Materials Testing,** was presented by G. A. Conger, Cambria Foundry & Engineering Division, Stevens Mfg. Co., Ebensburg, Pa., and included discussion of testing equipment and shell molding methods. Mr. Conger is chairman of the Shell Molding Materials Testing Committee which first met a year ago. The committee plans investigation of a series of property evaluation programs. These include such subjects as sand-resin mixing procedure, permeability and deflection of cured molds, hot and cold cured strength, hardness, and sample preparation. A "Tentative 8-N Reference Sand" has been selected by the committee.



"There's just one formality we have with all new employees of the company, Jack!"

Chairman of the third sand session was J. B. Caine, foundry consultant, Cincinnati. W. S. Pellini, Naval Research Laboratory, Washington, was cochairman. The first paper, **Ramming of Molding Sands,** by Harry W. Dietert and Alex L. Graham, both of Harry W. Dietert Co., Detroit, was presented by Mr. Dietert and concerned high-pressure ramming or molding.

The authors tested a group of four sands, using specimens prepared by squeeze ramming under pressures ranging from 0 to 400 psi, as compared to the conventional 50 to 60 psi squeeze pressure. The four sands, all in actual production, consisted of naturally bonded aluminum and iron foundry sands and synthetic iron and steel foundry sands.

It was found that green hardness and density increased rapidly with an increase in squeeze pressure. Permeability dropped rapidly with the first application of ramming pressure, but the rate of drop decreased at higher pressures. The authors state that high-pressure molding offers a means of obtaining a workable strength with a low percentage of clay substance. The higher the pressure, the lower the clay substance may be for a predetermined green compressive strength.

Green deformation, or plasticity, of a sand does not change greatly with ramming pressure after the first stage of ramming is passed, nor does sand lose its plasticity. Hot deformation is present even at pressures up to 500 lb during ramming. Retained hot strength rises with squeeze pressure.

J. B. Caine, chairman of the session, yielded the chair to Mr. Pellini to present the second paper, **Report of the Flowability Committee.** His report described a visual flowability test based on the size and number of void spaces in mold or core surfaces. These voids he termed "supervoids," voids not compatible with the particle size of the molding material.

Stating that the committee recognized that many manifestations of improper flowability are believed to exist, such as swells and strains, Mr. Caine said that expediency made it necessary to restrict work to the most basic phase of poor flowability, the evaluation and measurement of supervoids. There are indications that the supervoids are accentuated at the surface and decrease greatly in size in the central portions of the sand mass. If these observations are correct, they explain why it has been difficult to differentiate gross variations in supervoids with previous tests.

The committee recommends, therefore, that a foundry use its own sand and mulling and handling practice to prepare samples ranging from No. 10 (highest flowability) to No. 1 (lowest flowability). Samples should be made in standard 2-in. diam AFS specimen tubes, 2 in. high, plus or minus 1/16 in. A 14-lb weight should be *lowered* onto the sand and allowed to rest for at least 1 min. Ramming merely diminishes the detail of the supervoids without changing their nature.

The third paper, **Casting Surface Finish and Flowability of Sand,** by H. H. Fairfield and James McConachie, both of William Kennedy & Sons Ltd., Owen Sound, Ont., was read by Mr. Fairfield. The authors observed that many sands can be rammed to produce the same finish, but only by the use of different ramming. Assuming, therefore, that

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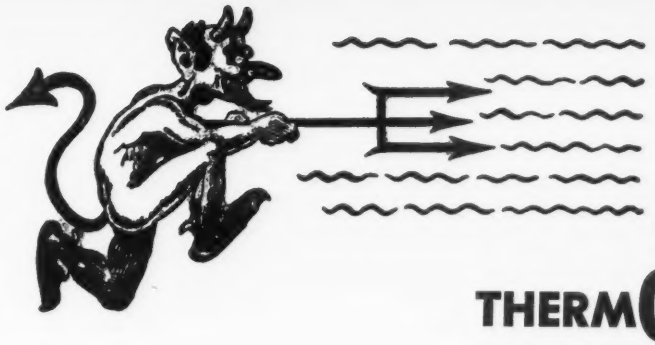

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THERMOTOMIC "X" is a patented exothermic compound that produces a temperature over 3500° F. It can be molded or baked into any desired shape the same as sand cores. THERMOTOMIC "X" is used as knock off core rings with 1½ inch feeder openings under risers of feeding heads, also as insulating sleeves, inserts and facings, or mixed with facing sand where it is desired to maintain fluidity of the casting metal. Shorter and more compact heads and risers can be used. The small feeder opening permits easy removal of feeding heads and risers. In conjunction with THERMOTOMIC COMPOUNDS, we recommend the use of exothermic CARBON FREE LIQUIDIZER NO. 5 on top of the metal in the heads or risers as an insulating cover. For green sand casting molds, use THERMOTOMIC WP (Waterproof).

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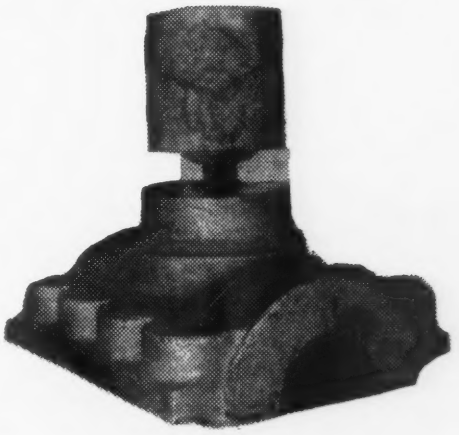
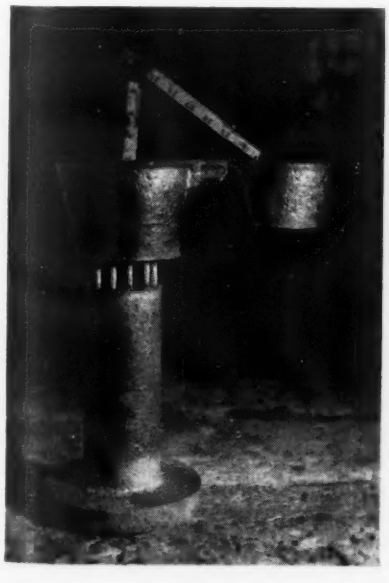
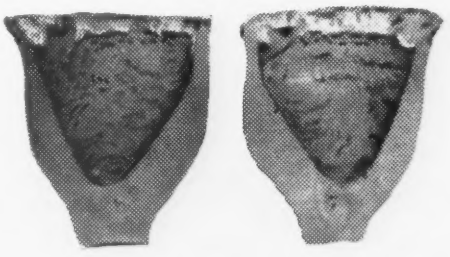


300 lb. aluminum bronze bearing cap cast with THERMOTOMIC feeding ring core under riser. Note small feeder opening which facilitates removal of riser from casting, resulting in greatly reduced cleaning costs.



THERMOTOMIC STRAINER CORE

Produces Monel Casting 270 lbs. solid



Made by direct pouring through the Thermotomic strainer core under the feeding head.

No chills were used, no shrinkage at the flange. Note depth of shrinkage in the feeding head.

NOTE THESE TYPICAL RESULTS FROM THE USE OF SOFFEL'S CARBON FREE LIQUIDIZER

With the application of 1 pound of SOFFEL'S CARBON FREE LIQUIDIZER, this 6" x 6" chrome-nickel-steel riser was reduced in weight from 32 pounds to 13 pounds average. A savings of 19 pounds of salable metal, normally discarded as scrap, was fed into the casting and produced a heavier, sounder casting. Note the feeding head can be knocked off easily, saving burning costs. There is no better feeding head compound at any price than SOFFEL'S CARBON FREE LIQUIDIZER.

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(*Continued from page* 154)
there must be a quality of sand that might be called "surface flowability," they prepared a device to measure that quality.

Their experiments showed that flowability decreases with water content, but green strength increases, with either southern and western bentonite or with fireclay. Flowability also decreased with any mixing beyond 30 seconds. In fact, any additives, including linseed oil, decreased surface flowability. The authors emphasized that their surface flowability, which relates to casting finish, should not be confused with plasticity or mass flowability.

Final sand session featured one technical paper and two committee reports. E. C. Zirzow, Werner G. Smith Inc., Cleveland, presided, and H. W. Meyer, General Steel Castings Corp., Granite City, Ill., was co-chairman.

Induced Flow Process of Baking Oil-Bonded Cores was subject of a paper co-authored by Prof. C. T. Marek, Purdue University, Lafayette, Ind., and R. J. Wimmert, Airco Division, Air Reduction Corp., Union, N. J. The former explained the purpose of the research project and the latter detailed the laboratory tests and their results.

Prof. Marek pointed out that the time required to drive moisture out of a core is at least two-thirds of the baking time. The problem, therefore, was: (1) To get heat inside the core to accelerate evaporation of water; (2) to find a method of removing steam from the core as rapidly as possible; (3) to get an adequate supply of oxygen into the core. To accomplish the foregoing, the "induced flow process" was conceived to force heated air through the core by developing a pressure difference between the top and bottom of the core plate or drier.

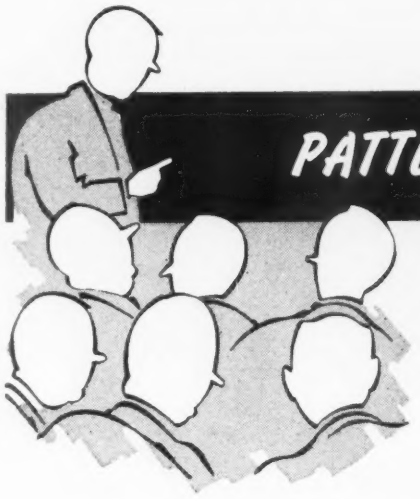
According to the investigators, the process requires only one-fifth of the time normally needed to produce a baked core; higher tensile strength is obtained, and no surface burning is apparent.

The authors believe that an entirely new type of core oven incorporating simplicity and economy can be developed. There would be two demands for such an oven — one for small foundries for limited quantity and the other for high-production shops and probably incorporating conveyor design.

Committee 8-J of AFS Sand Division presented a formal progress report covering **Veining Tendencies of C res.** H. H. Fairfield, William Kennedy & Sons Ltd., Owen Sound, Ont., chairman of the committee, abstracted the report which reviewed 1952 work on occurrence of core veining in gray iron castings. In addition to previous conclusions the recent investigations show definite relationship between hot strength, hot deformation and the veining tendencies.

Mr. Fairfield stated there are sound scientific reasons to support the theory that veining is caused by expansion or contraction in the surface layers of the core and lack of hot plasticity on the surface. To date, a best specimen shape and testing technique have not been discovered. The speaker indicated there is need for further research on the techniques of measuring thermal expansion and contraction of the core sand mixtures.

Committee 8-L on **Physical Properties of Steel Foundry Sands at Elevated Temperatures** contributed a progress report. Abstracted by Henry Robinson, Cornell University, Ithaca, N. Y., it covered tests pursued to ascertain expansion characteristics of the sand.



PATTERNMAKING

AN OVERFLOW audience that reached the proportions of flood stages discussed patterns for shell molding at the first of three Pattern Division sessions. The meeting was opened by J. W. Costello, American Hoist & Derrick Co., St. Paul, and was presided over by Vaughan C. Reid, City Pattern Foundry & Machine Co., Detroit, and H. J. Flaaten, Midwest Pattern Co., Minneapolis.

Ray Olson, Production Pattern & Foundry Co., Chicopee, Mass., in discussing **Patterns for Shell Molding** stated that with care and attention, aluminum patterns and plates will produce 5000 or more shells before they need replacing. One of the hazards in using aluminum patterns is their susceptibility to nicks and bumps. A common cause is carelessness in removing a sticking shell.

Patterns should be made with sufficient draft allowance to permit uninterrupted shell mold production with a broad range of sand-resin mixes, a thin shell, or a variation in conditions of cure. The tighter the draft allowance, the more closely these variables must be controlled. Mr. Olson indicated that ejector pin design and placement constitute an important factor, and that the cheapest design pin seems to be working most satisfactorily. Common carriage bolts and pins produced of drill rod on screw machines are used.

Speaking on **Pattern Equipment for Shell Molding,** O. C. Burg, Arrow Pattern & Engineering Co., Erie, Pa., discussed various types of alloys suitable for that purpose. He stated aluminum has many advantages, and that pressure-cast plates are suitable. Gray iron has better resistance to damage and better heat transfer. Thermal characteristics of the metal must be given proper consideration. In discussing gates, he indicated that smaller gates generally are required for shell molding than with green sand casting. Vertical pouring keeps gate size at a minimum.

What Research Offers in a Pattern Coating was described by C. J. Berg, Sherwin-Williams Co., Chicago, at the second session. E. T. Kindt, Kindt-Collins Co., Cleveland, and J. W. Costello, American Hoist & Derrick Co., St. Paul, presided.

Mr. Berg demonstrated with charts and photographs that an organic coating has been developed to meet the special requirements of protecting patterns. Its characteristics provide greater protection than the industry's two presently most widely used coatings.

While nine coatings were analyzed, one stood head and shoulders above the others. It provides excellent covering with one application and it is even more effectively applied by spraying than by brushing, thereby offering further labor saving advantages. It has a high gloss and is rapid drying; in approximately 30 minutes it can be handled. The odor is inoffensive. The dried coating is flexible or chip resistant, it is abrasion resistant and withstands moderately high temperatures.

(*Continued on page* 159)

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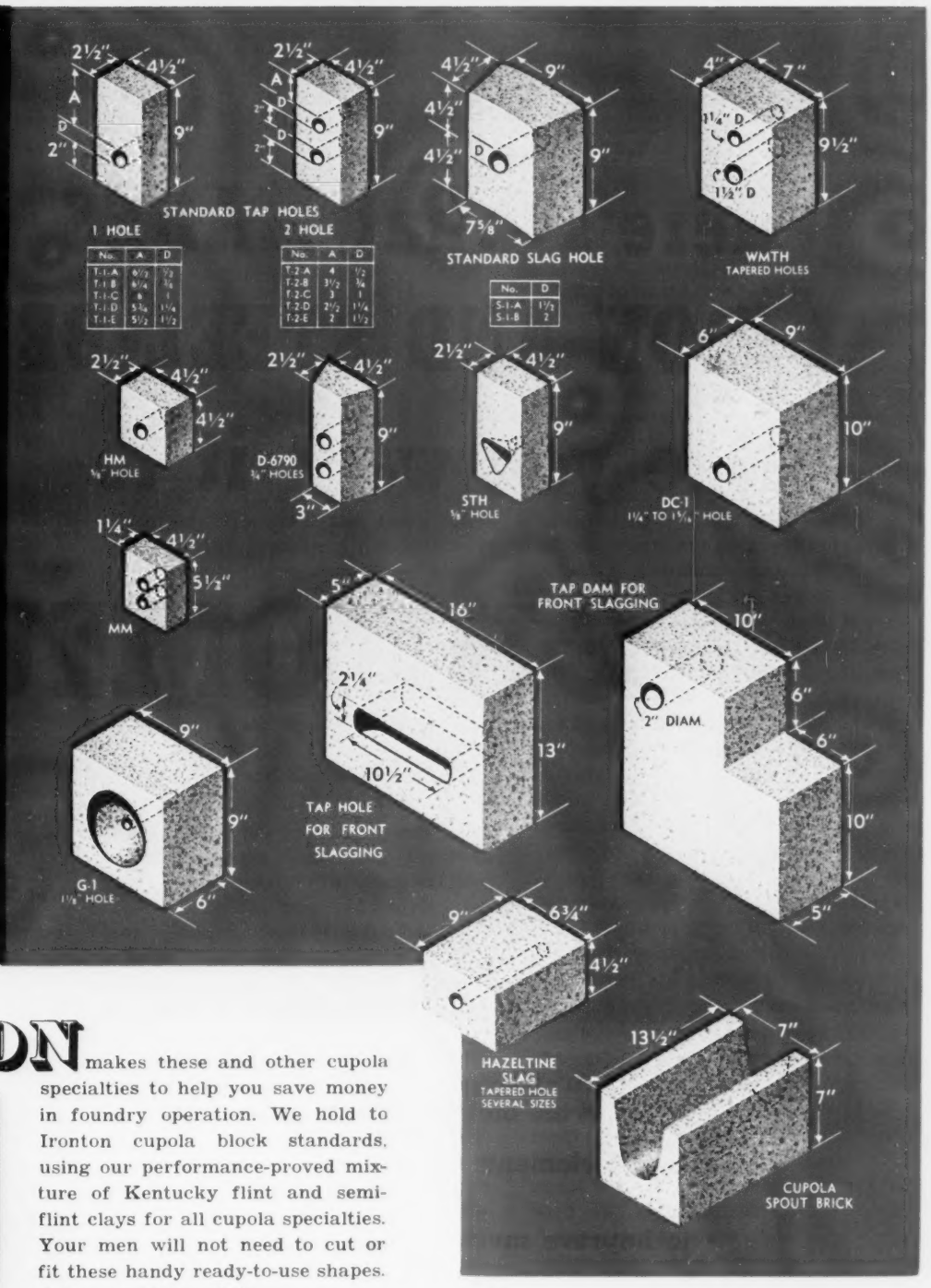

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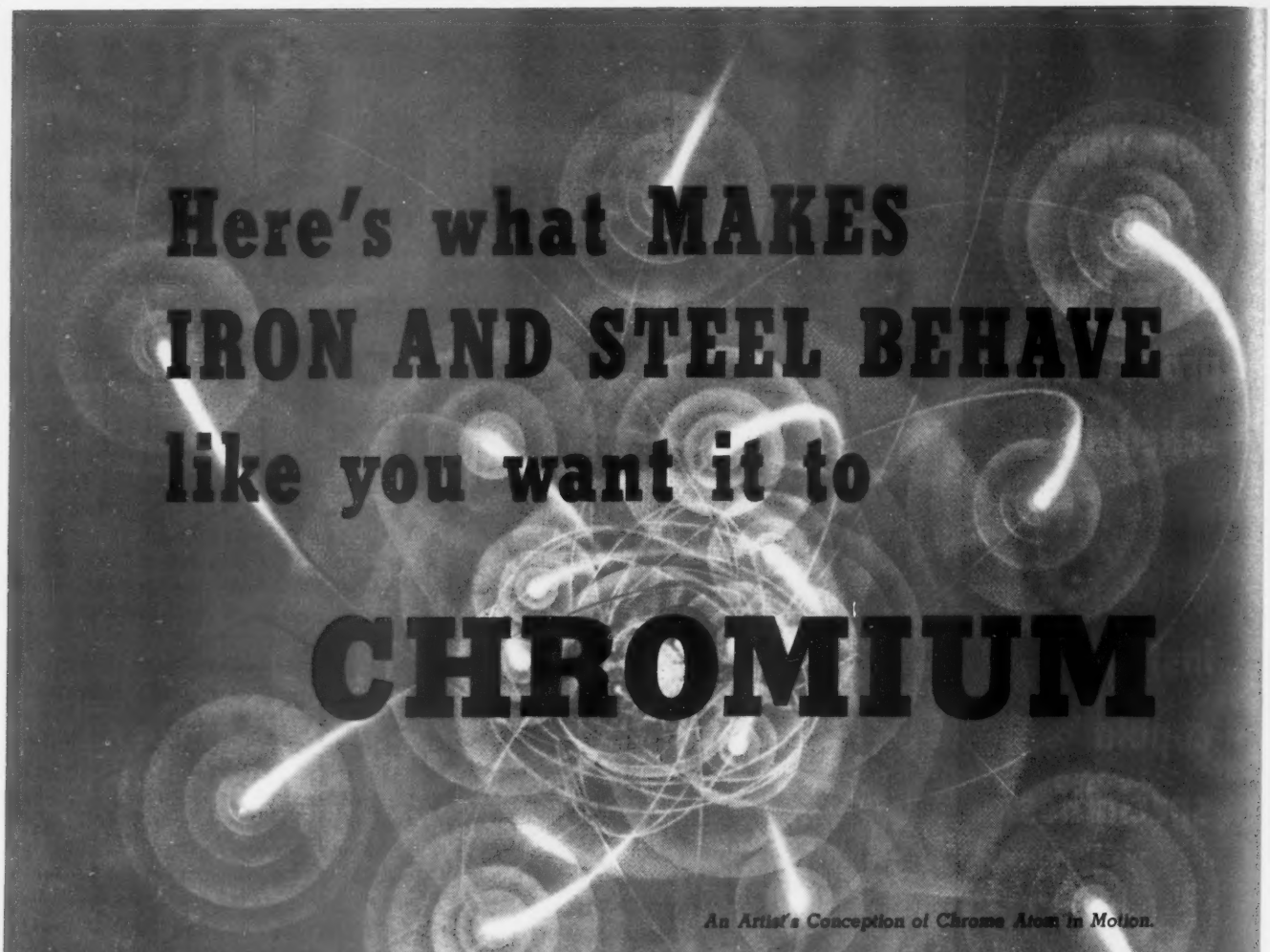

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STANDARD HIGH CARBON FERRO-CHROME
65-70% Cr. 4-6% Carbon

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60-66% Cr. 6-9% Si.
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(*Continued from page* 156)

Another important feature is its protection against moisture absorption and resistance to core sands. It was also pointed out the coating is equally effective with metal patterns applied directly to the metal or with a prime coat. (Editor's Note: The pattern coating referred to will be placed on the market shortly by the Kindt-Collins Co., Cleveland, under the tradename Kincote.)

During the discussion period, a sealer was described which has been used with great success by lumber millwork companies for maintaining dimensional stability in wood products. Because it can be applied rapidly and dries immediately, the patternmakers were urged to seal all the component pieces of a pattern for maximum dimensional stability. Treated wood can be glued with polyvinyl acetate adhesive.

Pattern Division's roundtable luncheon attracted a capacity audience. A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, started the session off by introducing officers of the division as well as other leaders of the pattern industry. An outline was distributed and Mr. Pfeiffer appealed to those attending to make themselves heard with either questions or comments.

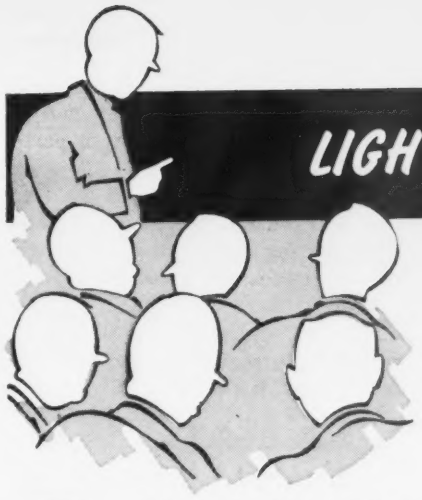
Postpone Decision

Heading the list was the suggestion for improved standard pattern procedures and methods. A three-class standard specification was suggested, but there was some negative comment and the decision was to look into the matter.

Kinds of production pattern metal led into a discussion of pro's and con's of plastics. The topic of master pattern procedures raised little comment, but brought up the question of the grain of mahogany showing up on castings. A putty was suggested as a filler. Also, it was mentioned that a new pattern wood, Carisa, has been found in South America which is half the cost of pine and is claimed to be better.

Considerable discussion followed on core blowing practice and included consideration of vents, metal coreboxes, metal lining for coreboxes and core driers. A new type of steel was mentioned for permanent mold application. A new development in pattern shop machinery was announced which features a revolving cutter on a revolving head for forming bosses on work that remains stationary.

To conclude the meeting, the advisability of getting more copies of the new AFS *Patternmaker's Manual* into circulation was pointed out.



LIGHT METALS

FIVE technical sessions and a luncheon comprised the Light Metals Division program. Subjects covered included magnesium and aluminum alloys; shell molding; permanent, semipermanent and investment molding; gating and metal flow principles, and a discussion of titanium castings and molding techniques.

Presiding at the first session were A. T. Peters, Dow Chemical Co., Bay City, Mich., and W. D. Danks, Howard Foundry Co., Chicago.

The first paper, **Magnesium Sand Casting Alloys Containing Thorium,** by C. E. Nelson, Dow Chemical Co., Midland, Mich., reported on elevated temperature, high-stress characteristics of magnesium castings in the following magnesium alloy systems: Al-Zn, rare earth-Zr, Zr-Th and Zn-Zr-Th. Comparisons of tensile and creep strengths indicated that the thorium alloys are superior in creep characteristics. Findings were based on experiments conducted over 1000-hr periods at 250 and 400°F. Tests at 500°F, although incomplete, also indicate good creep resistance for the thorium alloys.

It was pointed out that the thorium alloying agent is a hardener reduced from salts. There is no radiation activity unless additions to the melt are attempted directly with thorium salts.

In regard to castability of thorium alloys it was stated that they have an oxidizing effect and the resultant turbulence in the mold produces surface defects; however, Mg-Al-Zn alloys are worse in this respect.

Typical zirconium contents in thorium alloys are approximately one-half per cent, 0.7 being typical. Some zirconium and thorium is lost in melting. Loss of thorium amounts to about 5 per cent. Furthermore, chlorination will eliminate thorium from a melt; such loss is avoided by using flux to refine the metal.

Second paper, **Characteristics of High-Strength Magnesium Casting Alloy ZK61,** was by J. W. Meier, Department of Mines and Technical Surveys, Ottawa, Canada. Purpose of the paper was to present characteristics of the alloy in the light of additional laboratory work and actual service performance. It was found that optimum properties in both the as-cast and fully heat treated conditions are obtained only if the effective zirconium content is over 0.7 per cent and the average grain size is below 0.003 in. Also, highest strength values were obtained only with alloys containing 5-7 per cent zinc.

The most effective heat treating method for ZK61, depending upon casting size and shape, is in the following range: Solution heat treatment for 1-5 hr at 800-930°F, followed by air cooling and aging for 24-48 hr at 265-300°F. Sulphur dioxide atmospheres in heat treating were found to give the best protection, although carbon dioxide also was found to be satisfactory.

The alloy has comparatively high tensile, compression and shear strengths and good elongation. Fatigue properties also are high and residual stresses after heat treatment and aging are absent. Although the alloy was developed for room temperature service, it may be used at temperatures up to 300°F.

Experiments show that rare earth additions above 0.3 per cent decrease tensile properties, although additions of 1-2 per cent to alloys containing 4-6 per cent zinc do improve pressure tightness.

The luncheon session featured a paper, **Casting Magnesium Alloys in Shell Molds,** by N. Sheptak, Dow Chemical Co., Midland, Mich. F. P. Strieter, Dow Chemical Co., Midland, presided. J. L. Schmieder Jr., Oberdorfer Foundries Inc., Syracuse, N. Y., and A. J. Marotta, Utica Radiator Corp., Utica, N. Y., led the subsequent general discussion on shell molding.

The paper covered the development of tests for evaluating sand-resin mixes, effectiveness of inhibitors, breakdown of shell-core mixes, and cooling rates of shell-cast metal.

Tests showed that the nature of the bonding agent determines cure rate at a constant temperature and resin concentration. Transverse strength depends on resin formulation, length of cure, temperature of cure and sand grain fineness. Permeability exceeded the normal magnesium molding sand permeability of 80 to 100. A hot rigidity test indicated that a rigid shell was obtained at the same cure time as that required to obtain maximum hardness. A 5 per cent phenol formaldehyde bonded mix was used in the latter three tests.

In studying inhibitors to reduce metal-sand reaction it was found that of the mold washes boric acid, boric acid plus sulphur and a rubber compound were satisfactory. Ammonium borofluoride was the only satisfactory addition agent. A sulphur dioxide flush was unsatisfactory. Transverse strength of the shells was reduced 10 per cent by a 1 per cent addition of the ammonium borofluoride.

Analyze Shell Core Shakeouts

Shell cores most easily shaken out were those made with mixes containing urea formaldehyde, 3 per cent of 50 per cent phenol formaldehyde—50 per cent phenol furfural resin and 3 per cent and 5 per cent of 40 per cent phenol formaldehyde—60 per cent urea formaldehyde resin.

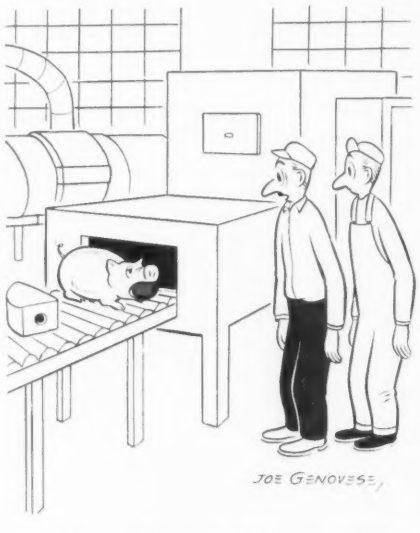
Work on cooling rates of casting indicated that the green sand casting cooled faster through liquidus to solidus range than either unbacked or dry heap sand backed shell castings. Castings in backed shells cooled faster than those in unbacked ones. Grain size decreased with increased cooling times.

In subsequent discussion Mr. Schmieder spoke briefly on coremaking in the shell process, saying that with the use of resin mixes, he has made cores that couldn't be made by other processes. However, he feels that shell cores have no advantage unless they show a cost saving or if a desired core cannot be made satisfactorily by conventional methods. Another consideration is that they are difficult to knock out of the casting and he has had to eliminate them in thin wall section work because of that fact.

Mr. Marotta stated some magnesium castings previously poured in green sand were made in shells by his company with good results. Inhibitors were used to eliminate metal-sand reactions. Difficulties to overcome are cost, odor and shakeout difficulty.

General discussion indicated that uneven metal pattern temperature during curing creates variances in dimensions of the resultant shell. Pasting of shells also can cause dimensional variations unless thickness of paste coatings is held constant. Although clamps are favored, it was pointed out that even a loose grain of sand at the parting can create a variance.

Dross inclusions resulting from turbulence were mentioned as the most usual defect in shell molded castings. Current studies on gating, particularly with vertical gating, may lead to methods that will eliminate that problem.



"What an odd way to bake an apple!"

Also pointed out was the fact that phenolic resins are being used in combination with other materials in an attempt to improve shakeout characteristics in the low-temperature-melting metals.

At the second light metals session W. A. Mader, Oberdorfer Foundries Inc., Syracuse, N. Y., presided and introduced E. M. Gingerich, co-author with M. E. Gantz Jr. and R. T. Woods of **Magnesium Alloy Permanent Mold and Semipermanent Mold Castings.** The three are with the Cleveland plant of Aluminum Co. of America.

Mr. Gingerich pointed to the advances of the last 10 years in casting magnesium alloys by this process. In his illustrated talk he described the many uses they serve because of high strength-weight ratio, machinability and comparatively low cost. Among casting developments is the addition of small amounts of beryllium to the alloys to reduce their tendency to burn and react with the mold wash. Grain refinement of the metal can be accomplished by treating molten metal with solid organic chlorides, eliminating costly and time-consuming superheating operation previously used in Alcoa foundries to refine grain structure.

Questions from the audience concerned the tolerances shown in the charts which were admitted to be somewhat optimistic; time of adding beryllium was clarified—after melting, and whether molds are flushed with sulphur dioxide as in sand practice. The latter was stated to be not normally necessary, the beryllium and standard refractory washes adequately taking care of this.

Co-chairman D. L. LaVelle, American Smelting & Refining Co., Barber, N. J., introduced S. Lipson, co-author with H. Rosenthal of **Agar Gels in Plaster-Bonded Investment.** The two are metallurgists at Frankford Arsenal, Philadelphia. To utilize a moist foamed-typed investment previously developed for aluminum alloys, a precoat containing 0.2 per cent agar in a water-mixed solution with the standard 70:30 silica-gypsum investment proved satisfactory. Effect of the agar was to thicken the slurry so that a dipped pattern was completely covered without appreciable loss by drainage. Experimental work was extended to cover its addition to standard nonferrous investment. Addition of 0.1-0.2 agar to the water component was sufficient to inhibit a common type of casting defect associated with separation of free water from the investment mix during setting process.

Discussion following concerned types of agar on the market. Mr. Lipson cautioned users on the variable quality of agar available today.

Effect of Casting Fiber on Mechanical Properties of Aluminum—4½ Per Cent Copper Alloys, by W. D. Walther, C. M. Adams and H. F. Taylor, Massachusetts Institute of Technology, was discussed by Mr. Walther. Considerable interest centered upon the investigation which was part of a larger research program designed to determine why castings of aluminum-copper alloys usually possess lower strength and ductility than might be expected. The study is concerned with existence and significance of a cast fibered structure in a high-purity aluminum-copper alloy.

Conclusions from the work described were: In high-purity aluminum-4 per cent copper alloy, mechanical properties were obtained in cast structures approaching properties comparably tested in wrought

(*Continued on page* 162)

BIG CYLINDERS

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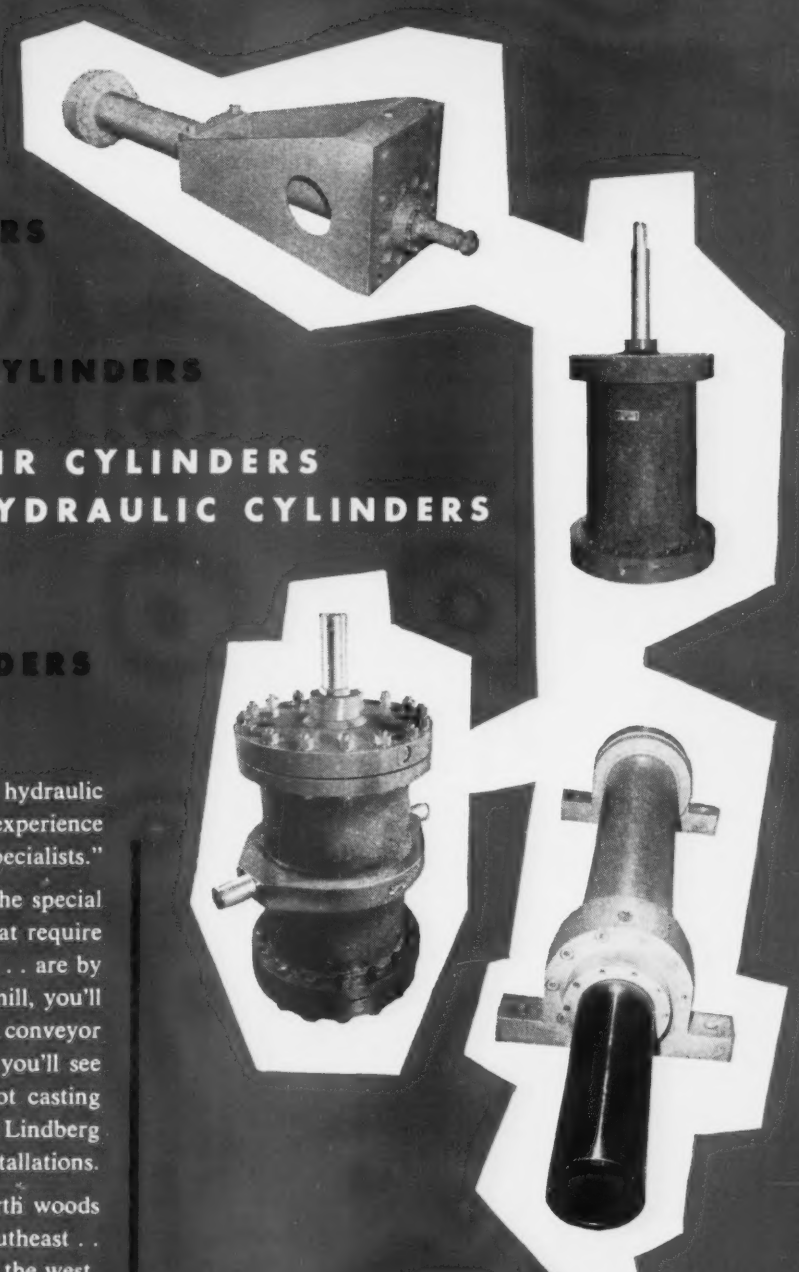

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LINDBERG CYLINDERS

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(*Continued from page* 160)

material. Reason for relatively low mechanical properties in cast aluminum-copper alloy is segregation of porosity at grain boundaries and between dendrite arms. Three distinctly different macrostructures were obtained by unidirectional rapid cooling. When the only variable was pouring temperature the macrostructure was columnar, and at still higher temperature twinned grains developed in profusion. Structures were reproducible.

Fiber type structure in the cast material, resulting from regimented porosity, gave directional properties similar to familiar conditions in wrought material. Equiaxed structures gave lower mechanical properties than either twinned or columnar types (contrary to some previous findings in another experiment.) Casting technique described for unidirectional heat flow from a freezing casting is a promising tool for studying solidification phenomena. Alloying elements and impurities raise temperature limits at which equiaxed, columnar, and twinned crystals arise. Alloying elements probably have a greater effect in shifting temperature limits upward than in spreading temperature increments apart.

At the third session T. D. Stay, Reynolds Metals Co., Cleveland, and P. J. Petto Jr., Fairfield Aluminum Co., Fairfield, Iowa, presided. In a paper, **Practical Foundry Applications of Principles of Ratio Gating,** L. L. Lucas, Wagner Mfg. Co., Sidney, O., described the use of fluid flow gating principles developed at Battelle Memorial Institute, in making small castings, mainly pots and pans, at Wagner. Production there is roughly 5 million castings a year, and since use of the revised gating systems, scrap has been reduced to 6½ per cent.

Second paper, **Velocities and Volume Rates of Metal Flow in Gating Systems,** by W. H. Johnson, H. F. Bishop and W. S. Pellini, Naval Research Laboratory, Washington, was presented by Mr. Johnson. Photographic and electronic measuring techniques were used to determine, quantitatively, effects of sprue runner and finger-gate variations on velocity and volume rates of metal flow from gating systems.

Results show that the effect of sprue height depends upon whether or not the gating system is choked or free-flowing. Sprue height variations have little effect on systems which remain free during pouring. Conclusions are that metal flow through equal area gating systems is determined by the metal head in the sprue cup and size of the cup opening. Velocities also are related to the metal head in the cup and to the distance of fall in the sprue.

In systems where the runner cross-sectional area is less than that of its sprue, flow velocity exceeds that through equal area systems.

Metal flowing along a runner after leaving the sprue constantly diminishes in velocity, causing the metal to "pile up;" when flow distance is about 15 times runner diameter the runner becomes full. A 1-in.-diam finger gate at the ends of 3 to 12-in. runners minimizes velocity variations in the runners. Velocities and flow rates through such finger gates are unaffected by runner length. Two-finger gates with cross-sectional area equal to runner area in equal area sprue-runner systems produce increased flow rates. Sixty per cent of the metal is discharged through gate at the runner extremity, and velocity is 12 per cent greater than through the finger nearest the sprue. In four-finger systems velocity through the gates is about equal; the flow rates are greater when the sprue is centrally located.

"The boss and his sense of humor—this is the raise he promised me!"

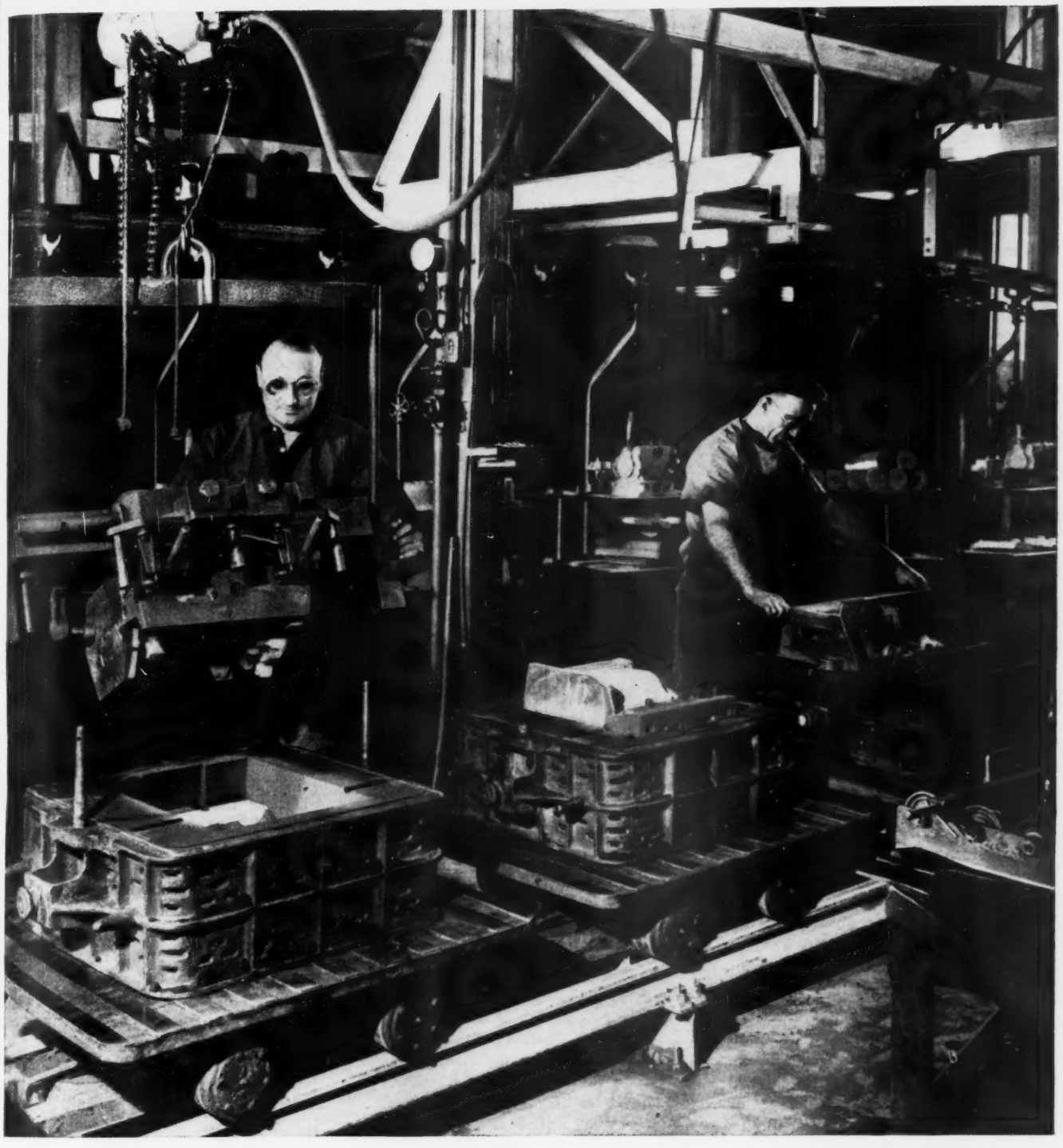
The third paper, **A Study of Vertical Gating—Light Metals Research Progress Report,** by J. H. Jackson, J. G. Kura and K. Grube, Battelle Memorial Institute, Columbus, O., was presented by Mr. Jackson. The study covered vertical gating as it pertains to shell and permanent molds and was based on observation of water flow through glass tubing sprues to plaster molds with Lucite windows. The experimental work has been under way for four months. Results so far indicate that rectangular sprues do a better job than round ones. Flow rate is less, consequently there is less jet effect and reduced turbulence as water enters the bottom of the mold. It also appears that tapered sprues which work well in horizontal gating systems also will do better in the vertical systems.

J. H. Jackson, Battelle Memorial Institute, and H. Rosenthal, Frankford Arsenal, Philadelphia, presided at the fourth session. First paper, **A Technique for Casting Titanium,** by O. W. Simmons, Rem-Cru Titanium Inc., Midland, Pa., and H. R. McCurdy, Frankford Arsenal, was presented by Mr. Simmons, formerly of Frankford Arsenal. The paper described equipment for casting a test bar at the arsenal. Melting equipment is a water-cooled copper crucible arc furnace equipped with a water-cooled, tungsten-tipped electrode and a water-cooled copper door which protects the mold during melting. The mold is machined from graphite, cured at 1200°F and is attached to one side of the furnace. Melts are made from a skull of titanium alloy.

The skull is made by laying five 2½-lb pigs on a ¼-in.-thick graphite slab on the bottom of the crucible. Pigs are made in the same furnace in advance by charging it with titanium sponge and the desired alloys. All melting is done in an argon atmosphere under slight positive pressure. Titanium melts at 3200°F and is poured at 3400°F. Alloys of the metal have good mechanical properties over a temperature range of —75 to 800°F. It also was pointed out that proper machining of titanium is a matter of education and experience. Unalloyed titanium is relatively easy to machine.

Second paper at the session, **Mechanical Properties of Cast Titanium —Carbon Alloys,** by O. W. Simmons, Rem-Cru Titanium Inc., and R. E. Edelman, Frankford Arsenal, was presented by Mr. Edelman. Tests made on specimens prepared from titanium sponge and 40 to 60 mesh carbon powder melted in an arc furnace show that cast Ti-C alloys have gradually increased strength accompanied by decreased ductility as carbon is increased up to 0.9 per cent. The decreased ductility with increasing carbon content is caused by the increasing amount of carbide formed. Heat treatment of Ti-C alloys merely offers stress relief; it does not in-

(*Continued on page* 164)



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GIFFELS & VALLET, INC.

INDUSTRIAL ENGINEERING DIVISION

1000 MARQUETTE BUILDING, DETROIT

(*Continued from page* 162)
crease ductility.

It was concluded that induction melting is not satisfactory for producing ductile titanium castings because from 0.3 to 1.0 per cent carbon is dissolved in the bath during melting in a graphite crucible. The amount of carbon is not predictable from heat to heat.

During discussion the statement was made that direct current is used instead of alternating current because in the former the bath is the anode and gets the greatest proportion of heat. It is in the ratio of two to one whereas in alternating current practice both the electrode and anode get equal amounts. It also was pointed out that the slight tungsten pickup from the electrode has no effect on the casting properties unless it appears on the casting surface.

Presiding at the fifth and concluding session were W. A. Dean, Aluminum Co. of America, Cleveland, and R. A. Lubker, Armour Research Foundation, Chicago. **Evaluation of Mold Materials for Titanium Castings** was the first paper. Written by R. M. Lang, J. G. Kura and J. H. Jackson, Battelle Memorial Institute, it was presented by Mr. Lang. Melts were prepared from titanium sponge formed into briquets and melted in a graphite-lined induction furnace enclosed in a sealed chamber filled with helium under slight, positive pressure. Test casting was 2 x 6 in. with a series of steps ⅛, ¼, ½, 1, 1½ and 2 in. thick to obtain varying section thicknesses. Castings were poured in fused zirconia, fused alumina, zircon and silica molds.

Conclusions were that titanium castings up to ½-in. in cross section can be cast with good surface finish and accurate reproduction of detail in graphite-washed zirconia or graphite-washed alumina shell molds. Four per cent phenolic resin was used to bond these molds. With larger section sizes there may be difficulty with pinholing and mold reaction.

Commercially acceptable castings with section sizes up to 2 in. may be cast in zirconia molds bonded with zirconium oxychloride. It was pointed out that the test casting used provided a severe trial of the mold materials. Most of the defects occurred at the re-entrant angles where section size changed. Good casting design would eliminate such angles and it is believed that many of the pinholes found in the test castings could be eliminated.

Concluding paper, **Preliminary Survey of Some Metallurgical Bases for a Titanium Castings Industry,** by R. F. Malone, H. T. Clark and W. L. Finlay, Rem-Cru Titanium Inc., Midland, Pa., and S. V. Arnold, Watertown Arsenal, Watertown, Mass., was presented by Mr. Malone. The speaker said that the chief stumbling block to commercial casting of titanium is its reactivity at elevated temperature to many materials and gases. Tests findings were based on cylindrically shaped castings. Success of experiments was based on evaluation of cast material hardness, condition of mold after pouring and casting soundness. Both graphite and magnesia molds were used and some reaction was noted in the magnesia mold. Melt contamination also was noted, principally from graphite and nitrogen.

The opinion was reached that skull melting can yield contamination-free castings and that a sound metallurgical basis exists for a future titanium castings industry.

The point was brought out during discussion that it is too early to say what the field will be for application of titanium castings; also that the handling of scrap will require greater care than with other metals. It is easier to start with the ore than to reclaim contaminated scrap.

MALLEABLE IRON

PROGRAM of the Malleable Division included four technical sessions and a roundtable luncheon covering a variety of subjects ranging from mechanization to graphitization and sand control.

The opening session was presided over by W. G. Ferrell, Auto Specialties Co., St. Joseph, Mich., and L. E. Roby, Peoria Malleable Casting Co., Peoria, Ill. Discussing **Mechanics of Foundry Mechanization,** R. J. Anderson, Belle City Malleable Iron Co., Racine, Wis., listed four reasons for mechanizing a foundry: 1) To reduce labor cost; 2) to reduce material cost; 3) to increase capacity with available floor space; and 4) to improve quality of product.

Mr. Anderson stressed two aspects of mechanization which he believed often are not understood. First, a foundry must take into consideration all aspects of the consequences of mechanization. Many units and operations not immediately seen to be affected often are involved in the mechanization of a different portion of a foundry's activities.

Second, as mechanization proceeds in a foundry, the results of mechanical failure become increasingly expensive. Eventually, the failure of any single, small item in a line can stop the whole line. Downtime that results from lack of good preventive maintenance wastes the fruits of mechanization and, Mr. Anderson asserted, is usually more a result of poor management and planning than of poor workmen.

During the discussion, Mr. Anderson said that he favors working on a 24-hr basis if labor and work are available and that standardization of equipment helps both maintenance and production.

Multiple Molding in a Malleable Shop, the second paper at the opening session, was delivered by J. G. Kropka, Chain Belt Co., Milwaukee, who said that stack molding involves using one side of a flask-mold as a cope and the other as a drag. Six to nine molds are stacked to a maximum of about 30 in. high and poured simultaneously.

Use of the technique involves special attention to several points, Mr. Kropka warned. Good squeezing is vital. Sand is even more important than usual because of the washing action of the metal as it descends the stacked molds. The sand-to-sand contact requires accurate offset. Proper flask size is essential, too. Mr. Kropka's company ordinarily uses flasks 13 x 19 in. by 3 in. high, although it sometimes employs them 14 x 20 in. by 4 in. high, also. Usual flask life is reported to be 8 to 10 years.

Asked what advantages stack molding offers Mr. Kropka replied that the process can turn out high produc-

(*Continued on page* 167)

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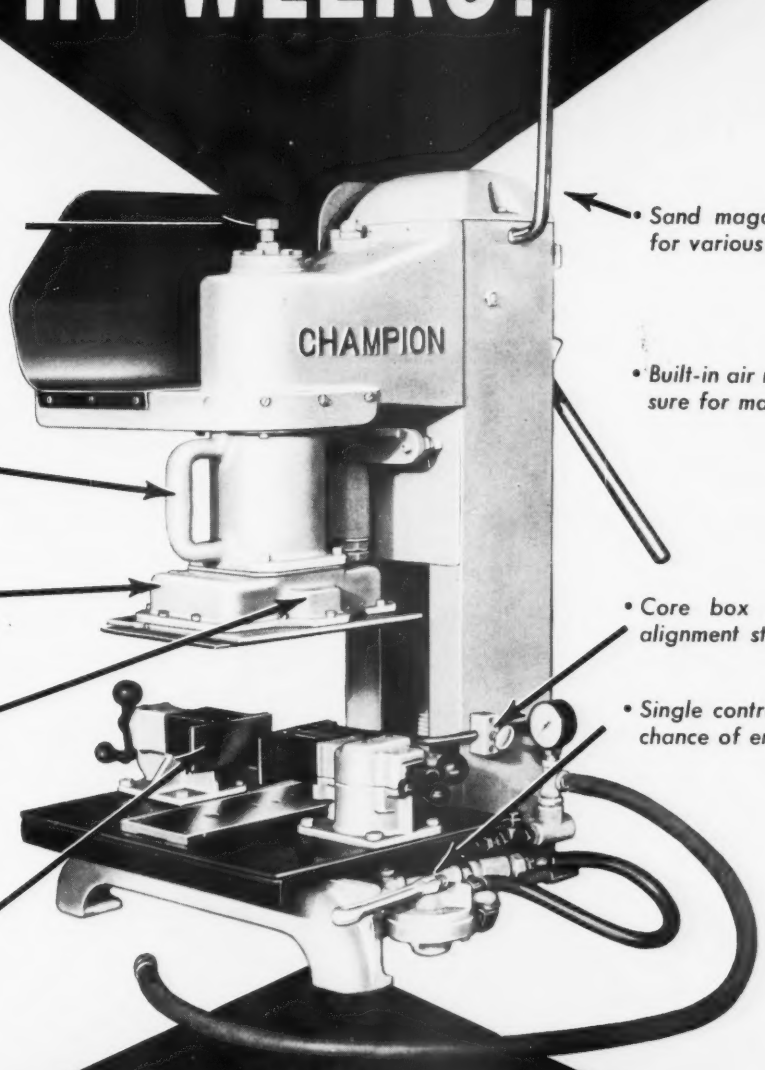

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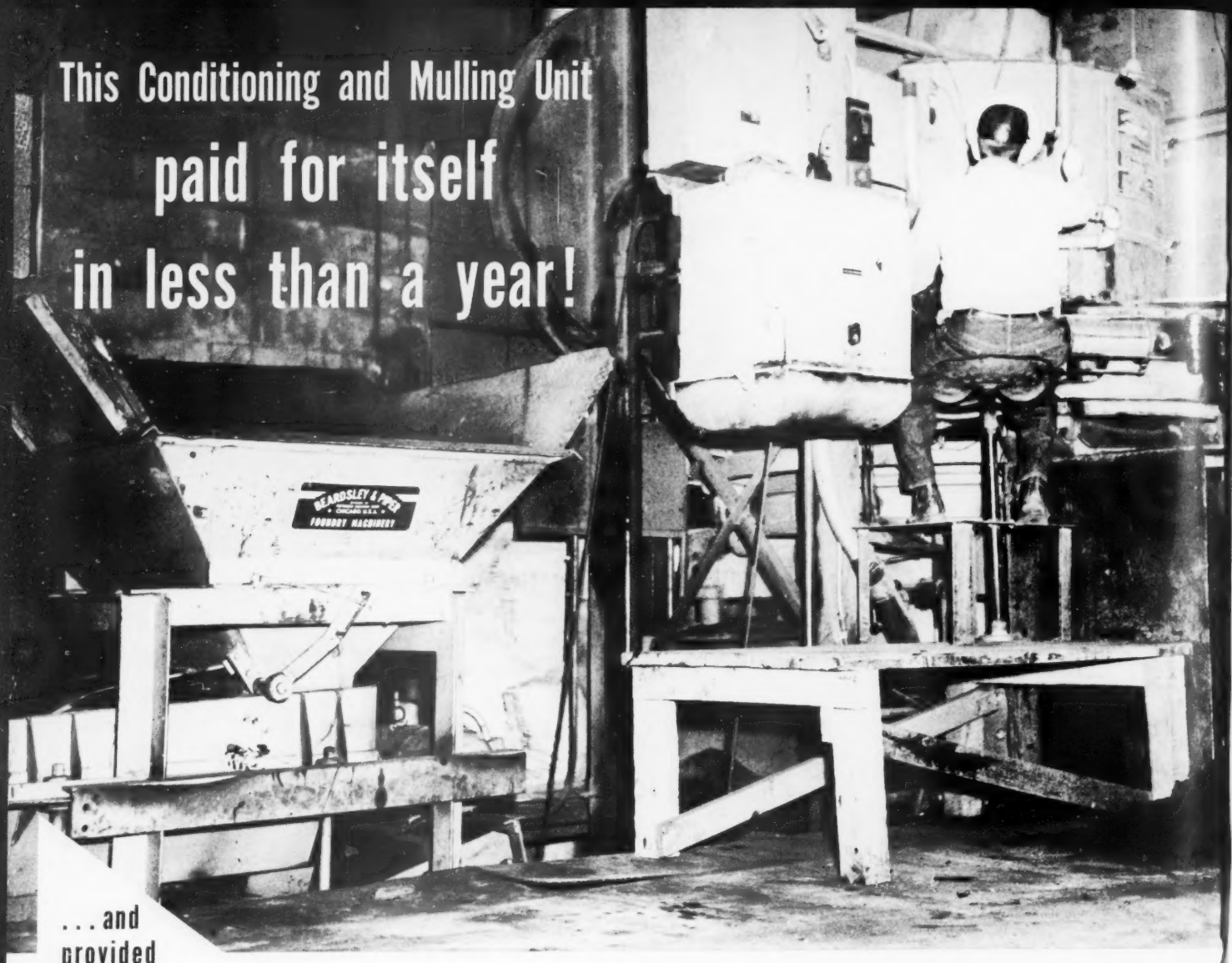

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(*Continued from page* 164)

tion jobs more cheaply than other methods. At Chain Belt, one nine-man unit makes 3700 molds a day. Three other men pour, shake out and sprue castings. Scrap varies from 4 to 11 per cent and usually is caused by poor pouring that introduces slag in the runners.

Questioned as to how tolerances vary in the top and bottom rows, Mr. Kropka explained that there is little variation, primarily because the bottom row usually has frozen before the top row is poured. To prevent breaking through of the bottom board, Chain Belt uses an asbestos board.

The second malleable session, under the joint chairmanship of C. O. Schopp, Link-Belt Co., Indianapolis, and N. N. Amrhein, Federal Malleable Co., West Allis, Wis., was devoted to two papers on melting subjects.

Air Furnace Design and Operation, by J. E. Rehder, Canada Iron Foundries Ltd., Montreal, was based on operating experience of various factors in the design of the air or reverberatory furnace operation and maintenance. Reference mostly was to furnaces used in duplexing practice fired with pulverized coal in the blackheart malleable foundry industry in Canada and the United States. Oil firing and the cold metal practice were touched upon briefly.

Decrease in the carbon content of the iron usually is desired. On this factor preliminary design conditions are based. Carbon-decreasing power of an air furnace obviously is related to nature of firing flame or furnace atmosphere, surface area of bath, time iron is in furnace, depth of bath, and temperature of the iron. With a furnace holding 2 to 2½ hours' supply of iron, the carbon content will decrease at the rate of about 0.02 per cent per square ft of bath area per ton throughout per hour. Therefore, for low-carbon iron the specific bath area is increased and the cupola is operated to provide low-carbon iron.

Data relating desired carbon content and bath area were shown in table form. Ratio of length to width of an air furnace should be from 4 to 1 for large furnaces to 5 to 1 for smaller furnaces. A gentle straight-line slope, ⅛-in. per ft from the burner end wall to a few feet short of the bridge wall with a sharp slope to the bungs over the bridge wall is the most efficient profile. Following reference to depth of bath, location of tap holes, height of bridge wall, firing rate, bridge wall opening and draft are summarized in a table. Where a firing rate of 108 lb of 15,000 Btu coal per sq ft per hour is suitable, then 8.1 gal of 200,000 Btu oil per sq ft per hour will serve satisfactorily.

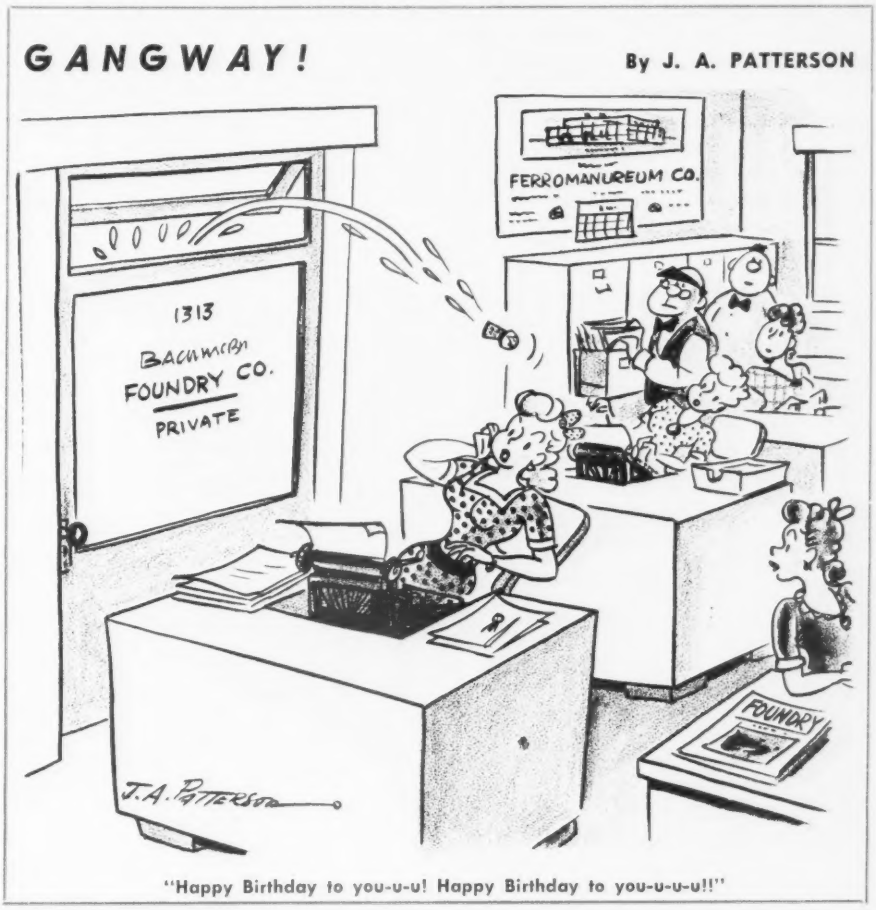
Suitable coal properties include low moisture content, 20 to 27 per cent volatile, 7 per cent ash, 14,000 minimum Btu per lb, grindability 85 Hardgrove minimum. Other items discussed at considerable length include volatile matter in pulverization, coal fineness, gas pressure, flame temperature, bath operation, slag and general maintenance of furnace.

Some of the features in the first paper were duplicated in the second paper—**Effect of Melting Furnace Atmosphere on Casting Properties and Annealability of Malleable Iron—Malleable Research Progress Report.** This paper, by E. A. Lange and R. W. Heine, University of Wisconsin, presented results obtained while continuing work on an AFS Malleable Division research project aimed at determining the influence of melting furnace atmospheres on the properties of malleable iron. Properties studied included the chemistry of iron, mottling, fluidity, hot tearing, annealability and as-cast microstructure. Results of elaborate tests on each of the items, illustrated by charts, tables and micrographs were presented in intimate detail. Melting stock for the project consisted of two types of white iron, one from a cupola air furnace duplexing shop, the other from a foundry using the cold melt air furnace process. The duplex process iron was selected first by the committee for detailed study in determining the principles which form the major portion of the paper. The cold melt iron was studied in a limited way with results presented in the concluding part of the report.

W. D. McMillan, International Harvester Co., Chicago, acted as chairman of the third malleable meeting. J. E. Dvorak, Eberhardt Mfg. Div., Eastern Malleable Iron Co., Cleveland, co-chairman, introduced the speakers.

J. T. Bryce, chief metallurgist, Albion Malleable Iron Co., Albion, Mich., presented the paper, **Influence of Furnace Atmosphere on the Annealing of Malleable Iron,** jointly prepared by him, A. Hernandez and F. B. Rote. The subject was attacked from the angle of the effect of the metal on the annealing atmosphere. The data were secured during production runs. The carbon which enters the furnace atmosphere comes from the metal and the balance between CO and CO_2 is governed by temperature. As the carbon from the iron decreases as cooling progresses, CO drops and CO_2 increases.

The conclusions reached after the series of tests indicate that decarburization is an inevitable phenomenon and that the evolution of carbon from the iron during the annealing cycle



"Happy Birthday to you-u-u! Happy Birthday to you-u-u-u!!"

changes the atmosphere even in prepared generator atmosphere furnaces. By introduction of air to control CO/CO_2 in ratios 2:1 and 3:1 it is possible to maintain satisfactory control of pearlite in the rim of castings. The formation and elimination of nodules determine these rim characteristics. Rate of heating is important in forming nodules and providing adequate minimum annealing.

In subsequent discussion it was pointed out that freezing time of the metal also affects the rim characteristics. Mr. McMillan stated that steel heat treating could not be applied to annealing malleable iron due to the carbon in the iron, and that even though decarburization is inevitable, it is not entirely undesirable but should be controlled. In answer to a question concerning origin of the oxygen to form CO in a sealed annealing container, it was pointed out that this element comes from the scale on the castings.

F. J. McDonald, Central Foundry Division, General Motors Corp., Saginaw, Mich., presented an analysis of **Gating to Control Pouring Rate and Its Effect on the Casting.** Molds were prepared on production molding equipment with regular production sand. Gating elements methodically analyzed included: Sprue cups, sprue post diameter, sprue post length, runner area, runner chokes, ladle height and the effect of skim cores on pouring rate.

This study proved that where skim cores are used to reduce the speed of the metal entering the mold, they can be eliminated by reducing the sprue post area and by choking the runner area. Pouring height has a marked influence on casting quality, and with pouring guide bars installed over the mold conveyor line at the pouring station, casting thickness variation caused by uncontrolled ladle height has been virtually eliminated.

At the fourth malleable session, chairman and co-chairman, respectively, were C. F. Semrau, Illinois Malleable Iron Co., Chicago, and F. A. Czapski, Chicago Malleable Castings Co., Chicago.

Graphitization in the Malleable Iron Industry, by H. A. Schwartz, W. K. Bock and J. D. Hedberg, all of National Malleable & Steel Castings Co., Cleveland, was delivered by Dr. Schwartz. E. A. Loria, Carborundum Co., Niagara Falls, N. Y., had been scheduled to discuss **First Stage Graphitizing Rates for Electric Furnace Annealing of White Cast Iron,** but his paper was not presented.

Because of the highly technical nature of his paper, which represented 12,000 hours of laboratory study of 200 or more specimens representing 3 tons of pouring, Dr. Schwartz confined his discussion to the paper's main points. Purpose of the paper is to investigate statistically the relation of all recognizable variables to the rate at which graphite separates during the freezing of white cast iron or during the several stages of the annealing process. It excludes variations in the annealing conditions, concerning itself only with the ability of the metal to precipitate graphite.

To these ends, the authors studied graphitization during freezing (mottling) in "first stage" gamma iron or supercritical heat treating, in the region where the gamma iron solid solutions decompose into alpha iron and graphite ("intermediate stage" annealing) and briefly in "second stage" or subcritical temperature annealing.

The most important element involved is silicon, the potency of which varies with the same changes in melting conditions which affect nodule number, cupola carbon and cupola silicon. The effect of these variables in the potency of silicon is further modified by heating rate in annealing. Slow heating tends to make the potency in all materials more nearly alike. Changes in potency are closely paralleled by changes in nodule number.

Present Written Discussions

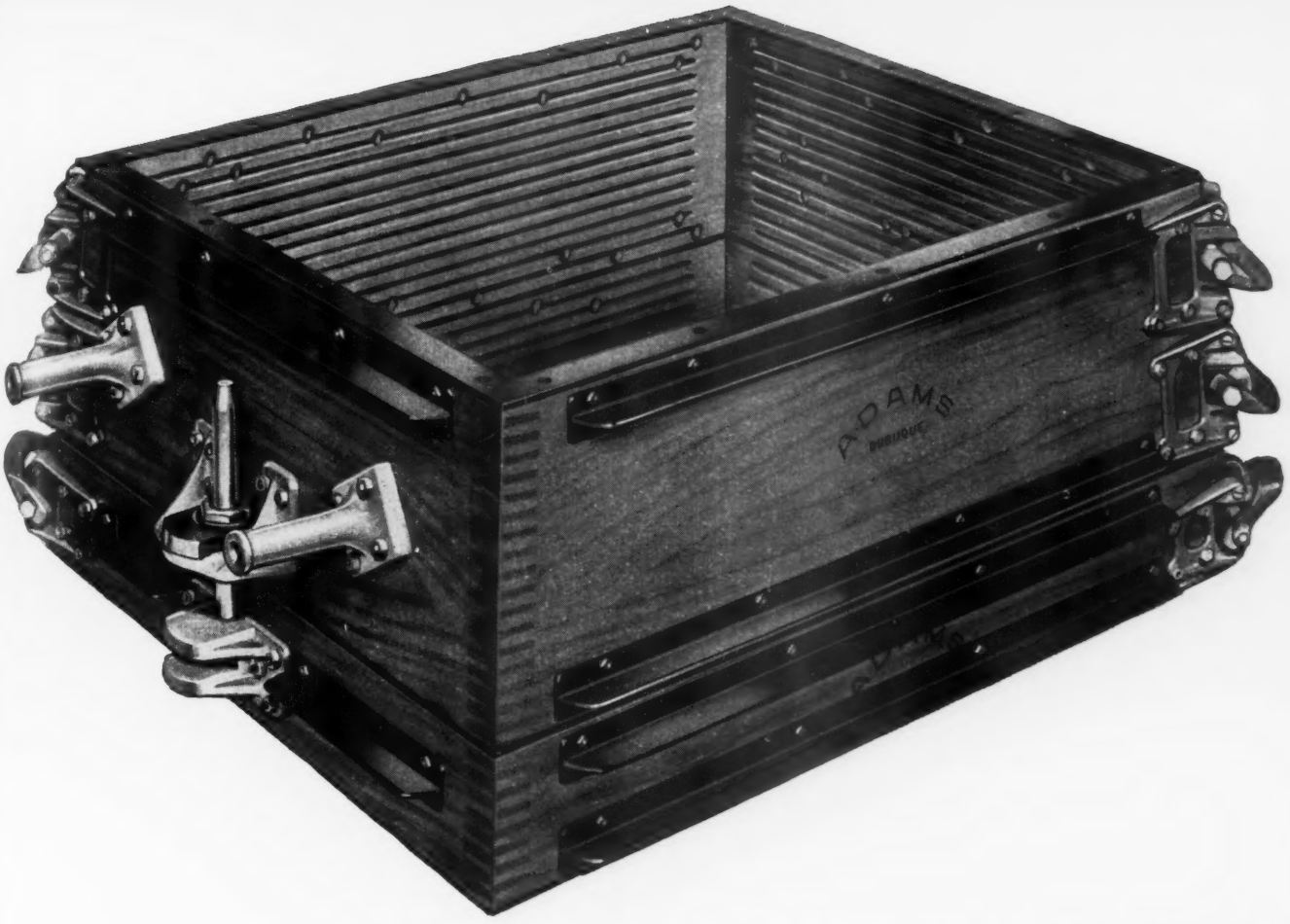
Observed relations of other elements within the range of compositions encountered in the practice being studied were not sufficient to give more than qualitative indications of their effects.

R. W. Heine, University of Wisconsin, presented a written discussion of the Schwartz-Bock-Hedberg paper describing the results of similar research, done by the controlled experiment method, at the University of Wisconsin. These experiments tended to confirm the work of Schwartz, Bock and Hedberg but also included work on furnace atmospheres, which Wisconsin researchers found to be involved with the occurrence of mottling. Mr. Heine also stated that silicon loss is *the* measure of oxidizing conditions, much better than carbon loss.

The malleable roundtable luncheon was presided over by R. J. Anderson, Belle City Malleable Iron Co., Racine, Wis. Co-chairman was W. A. Kennedy, Grinnell Co., Providence, R. I. After a welcome address by the president-elect of the ASF, Collins

(Continued on page 170)

View of the AFS annual banquet held at Hotel Morrison during the Chicago convention. Top row of the two-tier speaker's stage was missed by the photographer



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(*Continued from page* 168)

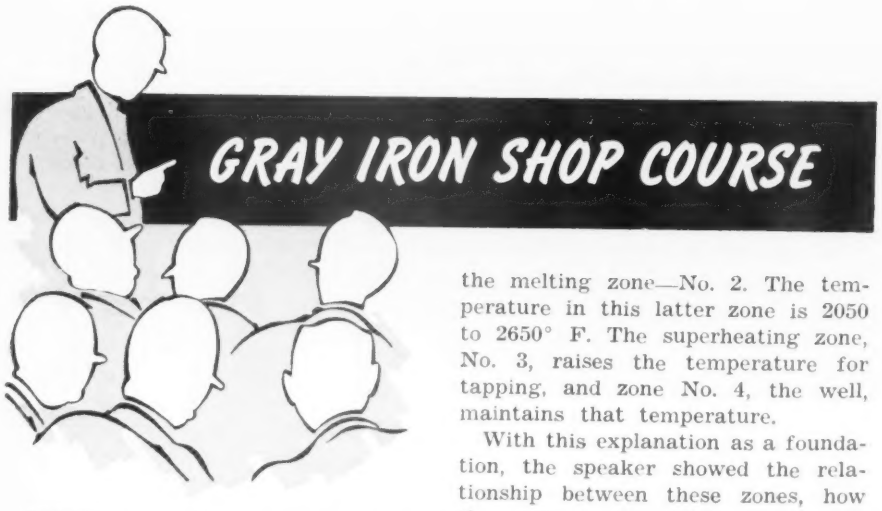
L. Carter, Albion Malleable Iron Co., Albion, Mich., foundrymen present enjoyed lunch and heard E. E. Woodliff, Foundry Sand Service Engineering Co., Detroit, speak on **How Far Should a Malleable Foundry Go in Sand Control?**

Warning that his question actually has many answers, varying with individual foundries, Mr. Woodliff said that sand control saves time and improves quality, but requires proper adjustment between labor and management. Because control devices must be adjusted by men, each of whom has his own idea about sand control, management must inaugurate and supervise a program and see to its adoption.

The most important man in a control program is the one who specifies and orders materials, for the rest of a program is useless if poor or improper sand is purchased. Once the right sand has been bought, it should be compounded with the same care as metals. Pausing to acknowledge the old debate about moisture content versus clay content, Mr. Woodliff named 4 to 5 per cent water and 12 per cent clay as ideal figures. He said that the main difference between natural and synthetic sands is that one is made and the other bought.

Speaking of core sand, he said that the best for any iron casting contains about ½ per cent natural clay, which gives about 300 to 400 per cent greater shock resistance. All ingredients of core sand must be weighed to hundredths of per cents, including clay, binders, oils and water.

In response to a question concerning whether a foundry should use natural or synthetic sands, he replied that the answer depended on the type of mixing equipment available. When properly mixed, either is satisfactory.



FIRST of the three evening Gray Iron Shop Course sessions had W. Holden of Eaton Mfg. Co., Vassar, Mich., presiding with E. J. Burke, Hanna Furnace Corp., Buffalo, as co-chairman. The discussion, titled **Melting Conditions in the Cupola,** was presented by D. E. Krause, Gray Iron Research Institute, Columbus, O.

According to Mr. Krause, the cupola is probably the most frequently abused and neglected piece of equipment, both as to maintenance and operation. In view of this he felt that a better understanding of its operating principles would cause it to receive the attention and respect it deserves with ensuing profit to the foundry.

With a blackboard sketch Mr. Krause outlined four distinct functional zones which he located on the basis of recent thermocouple tests. First, the preheat zone with temperatures from 300 to 1000° F and extending from the charging door to the melting zone—No. 2. The temperature in this latter zone is 2050 to 2650° F. The superheating zone, No. 3, raises the temperature for tapping, and zone No. 4, the well, maintains that temperature.

With this explanation as a foundation, the speaker showed the relationship between these zones, how they affect each other, the importance of the melting zone and why the following items in the operation of the cupola should and could be controlled: 1—Size of material charged. 2—Type of material. 3—Distribution of material. 4—Height of material. 5—Fluxing. 6—Coke ratios. 7—Bed height. 8—Burning-in time. 9—Patching to dimensions. 10—Tuyere ratio and service. 11—Blast rate. 12—Blast temperature. 13—Blast humidity.

With slides representing research carried on with a 10-in. cupola, Mr. Krause illustrated what happens to the shapes of coke and metal as they work their way down through the different zones.

Foundry Calculations and Essential Records was the main discussion subject at the second shop course. The speaker, K. H. Priestly, Vassar Electroloy Products Inc., Vassar, Mich., described the electric furnace melting practice and controls employed by his company in melting the metal.

With slides Mr. Priestly explained record forms used, how close specifications of metal are controlled and adjustments made for variations in raw materials. He also covered in considerable detail the chill tests employed as regular routine and the relationship between these tests and chemical and physical analyses. Another group of slides illustrated melting, molding and pouring operations. These views, photographed by the speaker, were extremely realistic and colorful.

At this point in the program, W. W. Levi, Lynchburg Foundry Co., Radford, Va., showed with slides a calculating chart his company uses in correcting the silicon and carbon content of its iron at the spout for inequalities in charging materials.

Concluding gray iron shop course, under the direction of Mr. Levi and E. J. Burke, Hanna Furnace Corp., Buffalo, N. Y., dealt with **Practical Aspects of Carbon Control in the Cupola.** A. J. Dublo, Sterling Foundry Co., Wellington, O., was the speaker.

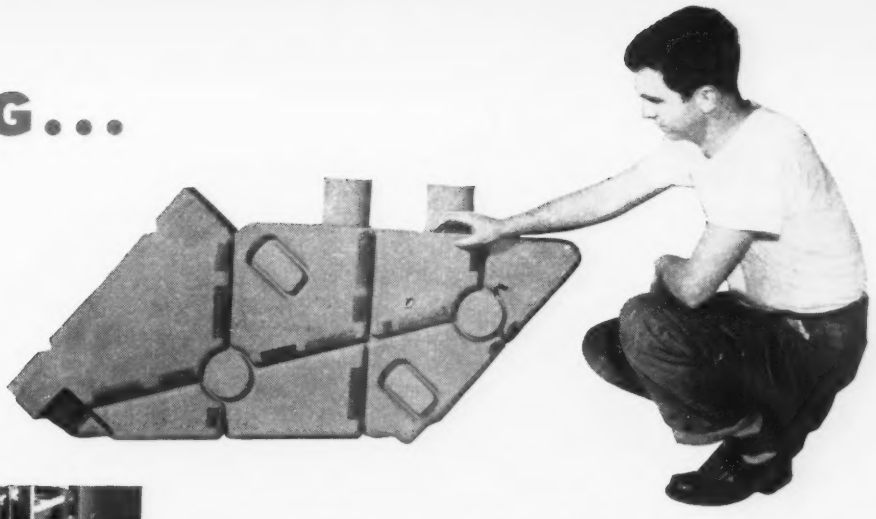
In Sterling's 58-in.-diam cupolas the bed is 58 in. high, using 1800-lb charges with 300-lb coke splits. Two-thirds of the bed coke is ignited in perforated drums in the yard, and dumped into the cupola on a thin layer of large coke protecting the sand bottom. According to Mr. Dublo, large and dense coke gives greater carbon pickup with low-carbon equivalent irons. Smaller coke, while giving lower carbon pickup, has the disadvantage of higher blast pressure, and reduced melting rate.

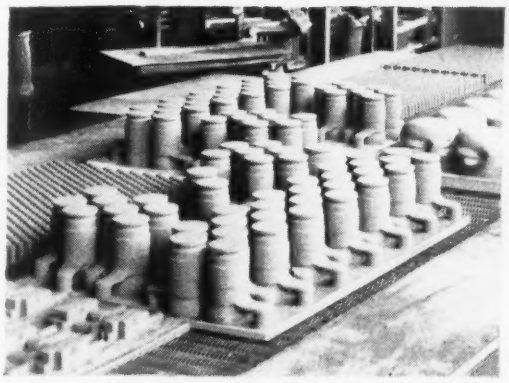
Smoke from cupola stack is watched—a blue or blue-gray color being the guide. If it turns dark brown or red-brown, an extra coke split is added and the blast is reduced about 10 per cent until iron at the spout indicates that oxidizing conditions have been overcome. Chill tests are maintained, and graphitizers and carbide stabilizers are added in the ladle as the conditions require.

Heat records are kept with data on coke size, chill tests, analyses, ladle additions, slag condition, air blast, etc. Slag in normal practice, with 70 lb dolomite and 5 lb soda ash per charge, is fluid and olive green to gray black in color. If slag becomes black and remains so for a period of time, blast is reduced slightly. If slag becomes viscous, a little more dolomite or soda ash is used. Metal temperature is about 2800 °F as determined by an optical pyrometer. Charging is by mechanical means, and all materials are weighed carefully under supervision.

(Balance of technical discussions will be reported in the July issue.)

BIG...





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Foundry Developments

By EDWIN BREMER

INVESTIGATION of the ductile properties of ferritic nodular irons by G. N. J. Gilbert, as published in the February issue of the *Journal of Research and Development* (Birmingham, England), indicates that such castings required to undergo conditions of impact in service should have the lowest possible phosphorus and silicon contents as may be consistent with other requirements. At room temperature annealed ferritic nodular iron may be subject to ductile failure with a relatively high impact value, or to brittle failure with a relatively low impact value depending on composition and treatment.

These changes are not accompanied by similar changes in the ductility as revealed by the normal tensile test; that is, a high elongation in the tensile test does not necessarily mean that the material will behave in a ductile manner in the impact test, although that conjunction of properties can be obtained by adjustment of composition. Both Si and P raise the temperature of transition from ductile to brittle fracture. By quenching from 450° C the impact transition temperature is raised, the material becoming temper-embrittled. The effect becomes pronounced only with high Si and/or P contents, and the effect of P is more marked than that of Si.

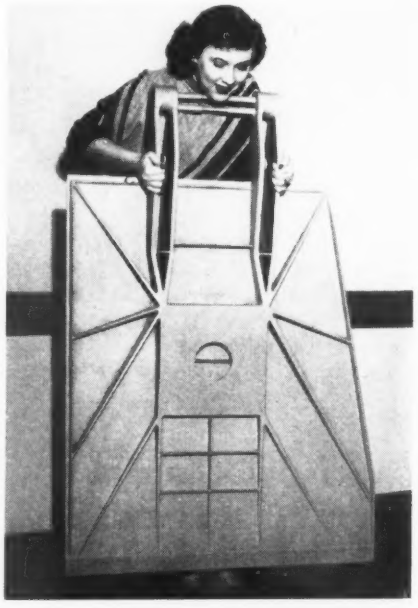
It also is shown that the unnotched impact test largely measures the energy required to initiate a crack, and the notched impact test largely measures the energy required to propagate a crack. Transitions occur in the energy required for both, and occur at different temperatures; crack propagation energy transition takes place at a higher temperature than the crack initiation energy transition.

* * *

INTERESTING hypothesis on why oxygen in cast iron results in formation of white cast iron is offered by Keizo Iwase and Masao Homma in Vol. 4, No. 4, of the *Science Reports* of the Research Institutes, Tohoku University, Sendai, Japan. On the basis of the atomic arrangement of the melt of cast iron and the double diagram (C. Wells), the authors indicate that the oxygen atoms behave partly as free atoms and partly as Fe-C-O-Fe clusters. The latter are said to prevent the melt from solidifying at the eutectic point C′ (austenite-graphite) by unbalancing the lever relation of E′C′F′, with the result that the eutectic point drops from C′ to C of austenite-Fe_3C, inducing the formation of white cast iron. Theoretically, the oxygen content effective for white cast iron formation was estimated to be about 0.01 per cent, an amount equivalent to the carbon percentage corresponding to E-E′.

* * *

NEW information on the thermodynamic properties of sodium-aluminum and potassium-aluminum silicates has been gained in experiments made by the Bureau of Mines and described in a technical report just released by the Department of the Interior. These silicates are constituents of some metallurgical slags and of certain refractory materials, as well as being important rock-forming minerals of the earth's crust. Report contains thermodynamic values, chemical analyses, heat capacity and heat content data for all minerals studied. Copy of Report of Investigations 4955, "Thermodynamic Properties of Sodium-aluminum and Potassium-aluminum Silicates" may be obtained from the Bureau of Mines, 4800 Forbes St., Pittsburgh 13.



Cast magnesium speed brake produced by R. H. Osbrink Co., Los Angeles, is light, as demonstrated by Miss Bette Harvey. Brake is largest designed for any contemporary fighter plane, being capable of withstanding more than 15,000 lb pressure. It is used on Chance Vought twin-jet F7U-3 Cutlass for U. S. Navy

* * *

ONE foundry casting aluminum alloy in permanent molds limits the production of grilles to periods when the atmospheric humidity is not over 30 per cent relative. The castings are thin in section and are polished all over. Even though nitrogen degassing was employed, it was found that when atmospheric humidity was over the indicated figure, the surface of the castings tended to contain minute pinholes which were difficult, if not impossible to remove by polishing.

* * *

Discussing "mold reaction" in an article in the Feb. 5 issue of *Foundry Trade Journal* (London), R. W. Ruddle stated that trials in industrial foundries making valves in 85-5-5-5 alloy showed a loss of 15 per cent in one particular casting made in the normal way because of leakage in the heavy section. However, increasing the residual phosphorus content in the alloy from 0.015 per cent to about 0.06 per cent eliminated the leakers. To obtain the proper control, he points out that the alloy must be substantially gas-free, and the lowest practical pouring temperature must be used.

* * *

PRODUCTION of a new cast steel freight car wheel is in early prospect. American Brake Shoe Co. has conducted 12 years of laboratory research and 5 years of field testing in developing this type wheel. The company is building a pilot plant in Alabama for the wheel's production and expects to complete commercial facilities in 1954 at a cost of about $3 million. For years most freight car wheels have been cast of chilled iron. Last year's production of iron wheels totaled 545,000 tons. Output of rolled or forged steel wheels in 1952 was approximately 350,000 tons, partly for railroad passenger cars. Reports also indicate that Griffin Wheel Co. has developed a cast steel wheel.

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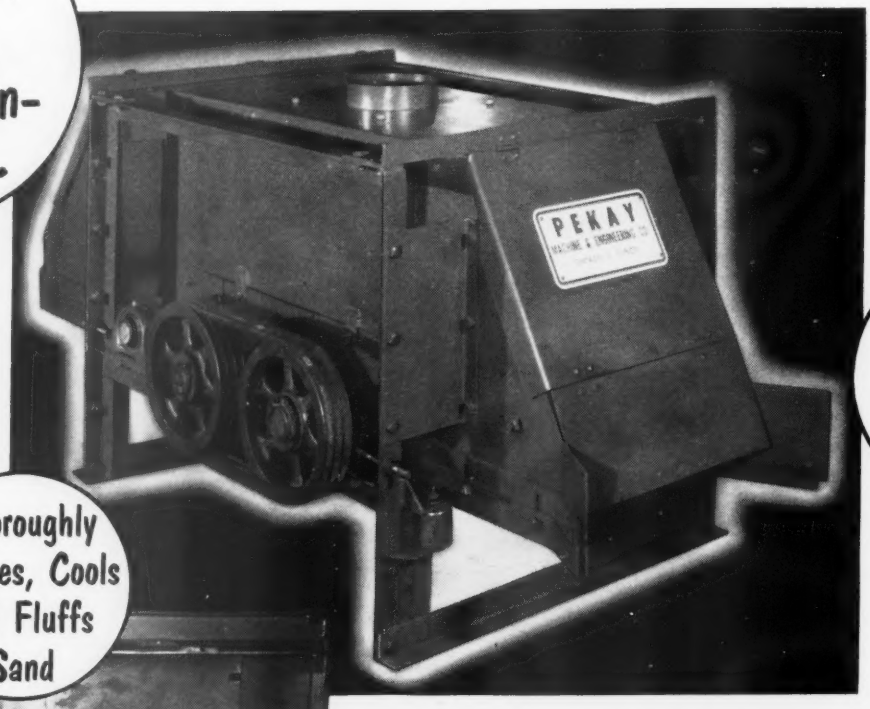
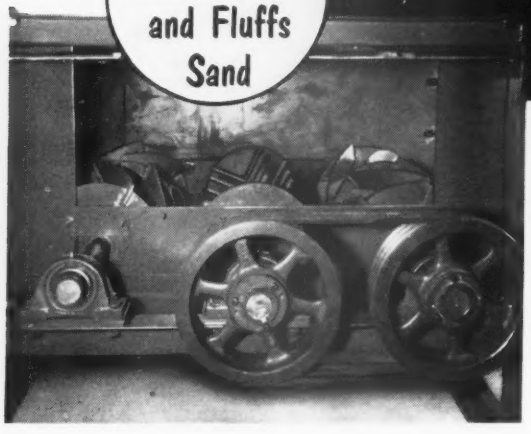


Stops Lump Trouble..

Thoroughly Aerates, Cools and Fluffs Sand



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The PEKAY Airator is a sturdily built but very compact unit. It's approximately 2′ high (above belt): 6½′ long; weighs 800 lbs. You can see the 2 aerating cutter wheels and the aerating fluffing wheel in the picture above (which also shows how easy it is to get at all functioning parts of the unit). These wheels thoroughly *aerate* and *cool* the sand carried directly into the Airator by belt conveyor. Capacity of the unit is practically unlimited.

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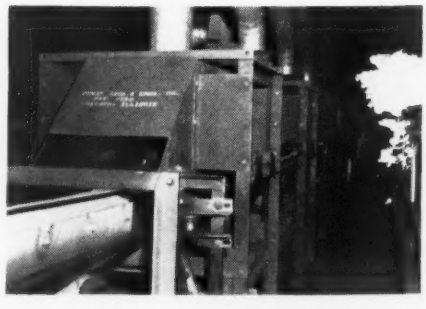
Here's another PEKAY development for more efficient, lower-cost foundry sand - conditioning. Units now in use are mulling better sand, with half the bonding material, at a volume increase per hour up to 85%!



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Typical Brinell Hardness Numbers of Some Nonferrous Alloys

(Continued from May issue)

Copper-Base Alloys

Type Alloy	Condition	Cu	Sn	Zn	Pb	Al	Mn	Fe	Ni	Other	Brinell
Cu-Zn-Pb	Cast	Rem	3.0	9.5	7.0						55–65
Cu-Zn-Pb	Cast	Rem	1.5	24.5	3.0						50–60
Cu-Zn-Pb	Sand Cast	Rem	0.26	30.52	0.52			0.24			R_b 14
Cu-Zn-Pb	Chill Cast	Rem	1.52	33.20	1.89	0.44	0.84	0.76	0.21		94
Cu-Zn-Pb	Cast	Rem		35.0	2.0						55–65
Cu-Zn-Sn	Chill Cast	Rem		37.66	1.53	0.06		0.12			76
Cu-Zn-Pb-Sn	Chill Cast	83	4	7	6						55–60
Cu-Zn-Pb-Sn	Chill Cast	76	2	16	6			0.25		P 0.05	43–48
Cu-Zn-Pb-Sn	Chill Cast	74.5–77.5	0.8–1.2	21–23	0.3–1.20			0.20			40–60
Cu-Zn-Pb-Sn	Chill Cast	72	2	22	4			0.30		P 0.02	40–50
Cu-Zn-Pb-Sn	Chill Cast	70	1	27	2						50–55
Cu-Zn-Ni	Cast	77	3	10	10			0.25		P 0.05	50–55
Cu-Zn-Si	Chill Cast	Rem	2.5	17.5	7.0			1.0	15.0		56
	w.q. aged 570° F.	Rem		10.0		1.0	1.0			Si 5.0	207
Cu-Zn-Sn	Cast	Rem	5.0	5.0	5.0						55–65
Cu-Zn-Sn	Cast	84.65	5.17	4.67	4.8			0.23	0.36		56
Cu-Zn-Sn	Sand Cast	Rem	6.0	6.0							50–65
Cu-Zn-Sn	Sand Cast	69.0	1.0	30.0							57–59

Sand Cast Aluminum Alloys

Type	Condition	Cu	Si	Mn	Fe	Mg	Ni	Zn	Al	Ti	Brinell
Al-Cu	H. T.-4	4.5	..	..	..	..	..	..	Rem.	..	65
Al-Cu	H. T. & Aged-6	4.5	..	..	..	..	..	..	Rem.	..	80
Al-Cu	H. T. & Aged-62	4.5	..	..	..	..	..	..	Rem.	..	95
Al-Cu	Aged 2 days R.T.	4.5	..	..	..	..	..	..	Rem.	..	46
Al-Cu	as cast	8.0	..	..	..	..	..	..	Rem.	..	50–70
Al-Cu	as cast	10.0	..	..	..	0.2	..	..	Rem.	..	100
Al-Cu	as cast	11.0–13.5	..	..	..	..	..	..	Rem.	..	75
Al-Cu-Fe	as cast	10.0	..	..	1.2	0.2	..	..	Rem.	..	85
Al-Cu-Fe	H. T.-2	10.0	..	..	1.2	0.2	..	..	Rem.	..	75
Al-Cu-Fe	H. T. & Aged-61	10.0	..	..	1.2	0.2	..	..	Rem.	..	100
Al-Cu-Mn	as cast	12.33	0.25	0.95	0.4	..	..	..	Rem.	..	75
Al-Cu-Ni	as cast	4.0	..	..	..	1.5	2.0	..	Rem.	..	80
Al-Cu-Ni	H. T. & Aged-61	4.0	..	..	..	1.5	2.0	..	Rem.	..	100
Al-Cu-Ni	Aged-571	4.0	..	..	..	1.5	2.0	..	Rem.	..	85
Al-Cu-Si	as cast	4.0	3.0	..	..	..	..	..	Rem.	..	55
Al-Cu-Si	as cast	4.5	1.2	0.3	..	..	..	..	Rem.	..	80
Al-Cu-Si	as cast	7.0	2.0	..	1.2	..	..	1.5	Rem.	..	55–80
Al-Cu-Si	as cast	8.0	1.2	..	1.0	..	..	..	Rem.	..	50–70
Al-Cu-Si	as cast	8.0	1.7	..	1.0	..	..	..	Rem.	..	110
Al-Cu-Si	annealed	8.0	1.7	..	1.0	..	..	..	Rem.	..	109
Al-Cu-Si	as cast	8.0	2.5	..	..	..	..	..	Rem.	..	65
Al-Cu-Zn	as cast	7.0	..	..	1.2	..	..	1.7	Rem.	..	70
Al-Mg	as cast	..	0.7	0.9	..	1.4	..	..	Rem.	0.3	40–60
Al-Mg	H. T.	..	0.7	0.9	..	1.4	..	..	Rem.	0.3	70–120
Al-Mg	as cast	..	1.8	..	..	3.8	..	..	Rem.	..	50
Al-Mg	as cast	0.37	0.19	1.0	0.28	5.96	1.49	..	Rem.	..	74
Al-Mg	H.T.-4	..	..	..	..	10.0	..	..	Rem.	..	75
Al-Mn	as cast	..	..	2.0	..	..	..	..	Rem.	..	85
Al-Si	as cast	..	5.0	..	..	..	..	..	Rem.	..	40
Al-Si	as cast	..	10.0	..	..	..	..	..	Rem.	..	45
Al-Si	modified	..	12.5	..	..	..	..	..	Rem.	..	50
Al-Si-Cu	as cast	3.0	4.0	..	..	0.3	..	..	Rem.	..	65
Al-Si-Cu	as cast	0.75	5.0	..	..	0.4	..	..	Rem.	..	97
Al-Si-Cu	aged	0.75	5.0	..	..	0.4	..	..	Rem.	..	148
Al-Si-Cu	H.T.-4	1.3	5.0	..	..	0.5	..	..	Rem.	..	60
Al-Si-Cu	H.T. & Aged-61	1.3	5.0	..	..	0.5	..	..	Rem.	..	90
Al-Si-Cu	H.T. & Aged-6	1.3	5.0	..	..	0.5	..	..	Rem.	..	80
Al-Si-Cu	H.T. & Aged-51	1.3	5.0	..	..	0.5	..	..	Rem.	..	60

(Concluded on page 176)

(*Concluded from page* 175)

Sand Cast Aluminum Alloys

Type	Condition	Cu	Si	Mn	Fe	Mg	Ni	Zn	Al	Ti	Brinell
Al-Si-Cu	H.T. & aged-51	1.4	5.0	0.8	..	0.5	0.8	..	Rem.	..	65
Al-Si-Cu	H.T. & aged-59	1.4	5.0	0.8	..	0.5	0.8	..	Rem.	..	80
Al-Si-Mg	H.T. & aged-4	..	7.0	..	..	0.3	..	..	Rem.	..	55
Al-Si-Mg	H.T. & aged-6	..	7.0	..	..	0.3	..	..	Rem.	..	70
Al-Si-Mg	H.T. & aged-51	..	7.0	..	..	0.3	..	..	Rem.	..	60
Al-Zn	as cast	2.5	..	..	1.2	..	..	11.0	Rem.	..	70

Permanent Mold Aluminum Alloys

Al-Cu-Fe	Aged-52	10.0	..	..	1.2	0.2	..	..	Rem.	..	105
Al-Cu-Fe	H.T. & aged-63	10.0	..	..	1.2	0.2	..	..	Rem.	..	140
Al-Cu-Fe	H.T. & aged-551	10.0	..	..	1.2	0.2	..	..	Rem.	..	115
Al-Cu-Ni	Chill Cast	4.0	..	..	..	1.5	2.0	..	Rem.	..	105
Al-Cu-Ni	H.T. & aged-61	4.0	..	..	..	1.5	2.0	..	Rem.	..	110
Al-Cu-Ni	H.T. & aged-571	4.0	..	..	..	1.5	2.0	..	Rem.	..	105
Al-Cu-Si	H.T.-4	4.5	2.5	..	..	..	..	..	Rem.	..	75
Al-Cu-Si	H.T. & aged-6	4.5	2.5	..	..	..	..	..	Rem.	..	90
Al-Cu-Si	Chill Cast	7.0	1.7	..	1.2	..	..	..	Rem.	..	70
Al-Cu-Si	Chill Cast	7.0	3.5	..	1.2	..	..	2.0	Rem.	..	80
Al-Cu-Si	annealed-2	7.0	3.5	..	1.2	..	..	2.0	Rem.	..	70
Al-Cu-Si	Chill Cast	10.0	4.0	..	1.0	0.2	..	..	Rem.	..	100
Al-Mg	Chill Cast	..	0.7	0.9	..	1.4	..	..	Rem.	0.3	40–60
Al-Mg	H.T.	..	0.7	0.9	..	1.4	..	..	Rem.	0.3	70–120
Al-Mg	Chill Cast	..	..	..	..	3.8	..	1.8	Rem.	..	60
Al-Si	Chill Cast	..	5.0	..	..	..	..	..	Rem.	..	40
Al-Si-Cu	H.T.-4	1.3	5.0	..	..	0.5	..	..	Rem.	..	60
Al-Si-Cu	H.T. & aged-6	1.3	5.0	..	..	0.5	..	..	Rem.	..	90
Al-Si-Cu	H.T. & aged-51	1.3	5.0	..	..	0.5	..	..	Rem.	..	75
Al-Si-Cu	Chill Cast	4.5	5.5	..	..	..	..	..	Rem.	..	70
Al-Si-Cu	Chill Cast	0.8	12.0	..	..	..	..	..	Rem.	..	80
Al-Si-Cu	Chill Cast	1.0	20.0	..	0.7	..	..	..	Rem.	..	85
Al-Si-Mg	H.T. & aged-6	..	7.0	..	..	0.3	..	..	Rem.	..	90
Al-Si-Ni	Aged	1.2	10.0	1.4	..	..	2.4	..	Rem.	..	170
Al-Si-Ni	H.T.-4	0.8	12.0	..	0.8	1.0	2.5	..	Rem.	..	100
Al-Si-Ni	Aged-551	0.8	12.0	..	0.8	1.0	2.5	..	Rem.	..	105
Al-Zn	Chill Cast	2.75	..	..	..	..	..	13.5	Rem.	..	65–70

Sand Cast Magnesium Alloys

Type	Condition	Al	Si	Mn	Mg	Zn	Cu	Cd	Zr		Brinell
Mg-Al	H.T.-4	8.0	<0.3	>0.15	Rem.	<0.3	..	..	..	..	48
Mg-Al	as cast	10.0	<0.5	>0.1	Rem.	<0.3	..	..	..	..	54
Mg-Al	H.T.-4	10.0	<0.5	>0.1	Rem.	<0.3	..	..	..	..	52
Mg-Al	H.T. & aged-61	10.0	<0.5	>0.1	Rem.	<0.3	..	..	..	..	69
Mg-Al	as cast	12.0	<0.5	>0.1	Rem.	<0.3	..	..	..	..	65
Mg-Al	H.T. & aged-6	12.0	<0.5	>0.1	Rem.	<0.3	..	..	..	..	85
Mg-Al-Zn	as cast	4.0	..	0.3	Rem.	3.0	..	..	..	..	50
Mg-Al-Zn	as cast	4.5	..	0.4	Rem.	3.5	..	..	..	..	45–50
Mg-Al-Zn	as cast	6.0	<0.5	>0.15	Rem.	3.0	..	..	..	..	55
Mg-Al-Zn	H.T.	6.0	<0.5	>0.15	Rem.	3.0	..	..	..	..	55
Mg-Al-Zn	H.T. & aged	6.0	<0.5	>0.15	Rem.	3.0	..	..	..	..	70
Mg-Al-Zn	as cast	8.5	..	0.2–0.5	Rem.	0.5	..	..	..	..	60
Mg-Al-Zn	as cast	9.0	<0.5	>0.10	Rem.	2.0	..	..	..	..	60
Mg-Al-Zn	H.T.	9.0	<0.5	>0.10	Rem.	2.0	..	..	..	..	59
Mg-Al-Zn	H.T. & aged	9.0	<0.5	>0.10	Rem.	2.0	..	..	..	..	77
Mg-Cu	as cast	2.0	<0.5	>0.15	Rem.	<0.3	4.0	2.0	..	..	40
Mg-Mn	as cast	..	<0.3	1.2	Rem.	..	..	..	..	..	33
Mg-Zr	as cast	..	..	..	Rem.	..	..	..	0.5	..	38

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MERCHANDISING OF MALLEABLE CASTINGS

Discussed at Market Development Conference

By FRANK G. STEINEBACH
Editor

SALESMEN in the malleable castings industry are seeking improved merchandising techniques that will sell more malleable castings. This interest in better sales methods was demonstrated in both attendance and interest accorded the Fourth Market Development Conference for executives and sales personnel of the malleable industry held at the Illinois Institute of Technology, Chicago, Apr. 9-10. The affair was sponsored by the Malleable Founders' Society in co-operation with the institute.

One of the most interesting aspects of the two-day conference was the large number of young men in attendance. Those in charge of arranging the affair were particularly grateful that member companies are sending these young salesmen to benefit from the exchange of experience among those with much longer experience in selling malleable iron castings.

The program included a wide variety of subjects having a bearing on sales problems. Attention was given to the fundamentals of selling and specific studies of the particular factors affecting sales of castings. Over-all future prospects of the industry were considered, and a session was devoted to progress in the foundry industry. Included in the latter were papers on shell molding, pearlitic malleable, and phases of testing. T. A. Scanlan, director of sales, Eastern Malleable Iron Co., Newburgh, N. Y., and chairman, Market Development Committee of the society, presided at the sessions.

In welcoming the participants in the conference, J. T. Rettaliata, president, Illinois Institute of Technology, sketched the history and development of that organization, formed in 1940 through a merger of Armour Institute of Technology and Lewis Institute. Affiliated with the institute are the Armour Research Foundation, the Institute of Gas Technology, and the Central Research Laboratory of the Association of American Railroads. Mr. Rettaliata stressed the dangers in the present shortage of engineering graduates and suggested the organizing of a public relations campaign to sell parents and teenagers on the opportunities provided through an engineering education.

Shell Molding—The subject of shell molding was introduced by Frank D. Brisse, president, Laconia Malleable Iron Co., Laconia, N. H., and president of the society, in his remarks to the conference. Mr. Brisse told of the experience of his organization in producing malleable castings in shell molds and stated he wanted all present to think seriously about the advantages of that method of production. He illustrated his talk with the shells used in producing a bicycle stem casting, and showed the gate of castings and the finished, polished part. Eight of these castings now are being produced in a shell mold, but when the pattern is remade, they anticipate placing 10 to 12 castings in a single mold.

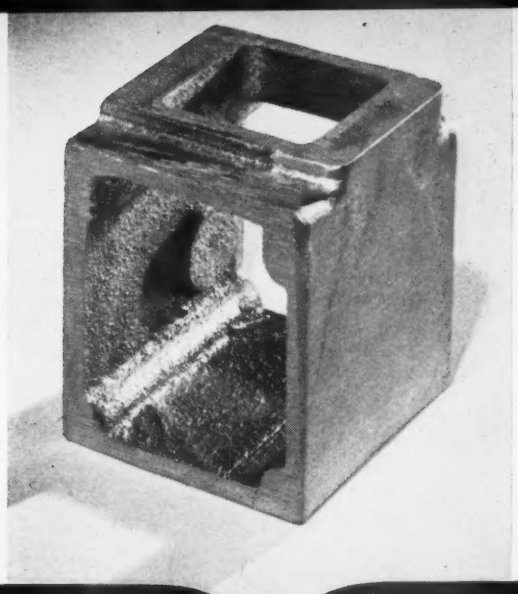
Molds are pasted, and no backup is used. Experience has shown that backing sand affects the surface of the casting adversely. A sand of 130 AFS fineness with from 6 to 10 per cent resin is used. The stem is produced with 6 per cent resin. The mixture is mulled for 20 minutes. Pattern is held at 400 °F, and the shell is baked 35 seconds. It has been demonstrated that an underbaked shell is stronger than one that is overbaked.

Mr. Brisse indicated that the foundry loss is less with shell molding than with regular production methods. He believes that castings can be produced as cheap or cheaper in shell molds, although he indicated

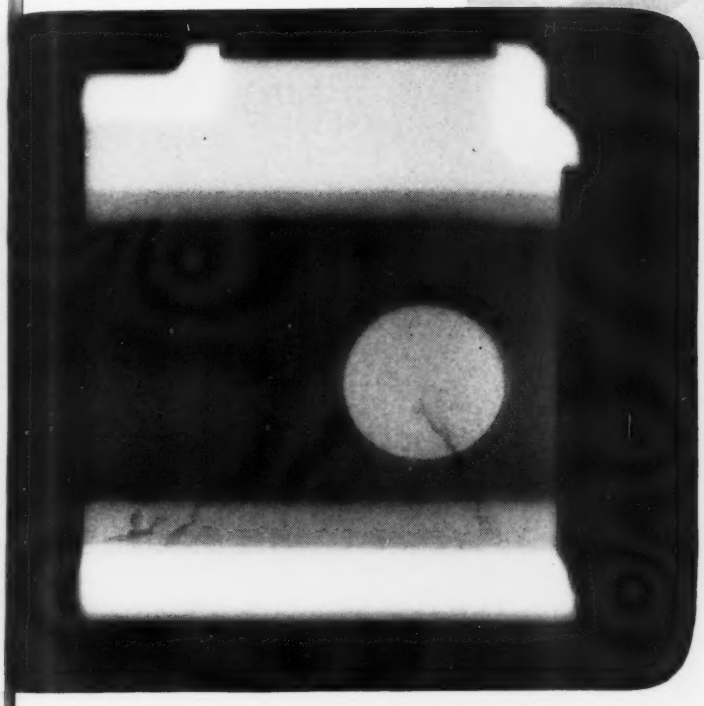
(Continued on page 181)

View of dinner meeting held the opening day of the Market Development Conference in Chicago

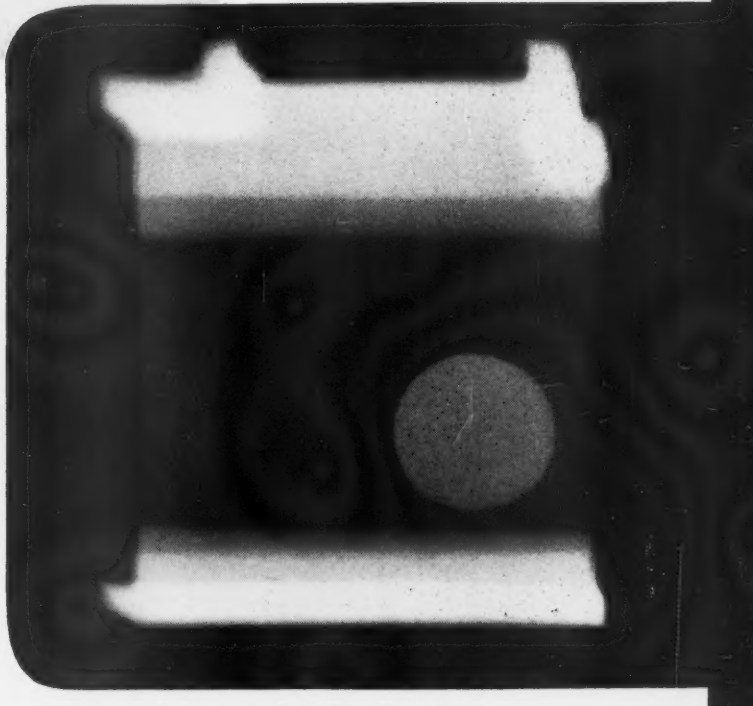
When shrink occurs...



Yield shrinks, too...



Radiograph shows recurring defects due to shrinkage.



A change in gating produced sound castings.

Radiography helps avoid shrink

Shrink can pose a real problem in casting 355 aluminum. It did with this instrument housing.

But radiographs of the pilot runs showed a recurring pattern of defects. This suggested a change in gating which quickly corrected the difficulty.

This is a typical reason why more and more foundries are making full use of radiography. It proves the soundness of their work—helps build a reputation for prompt delivery of good castings.

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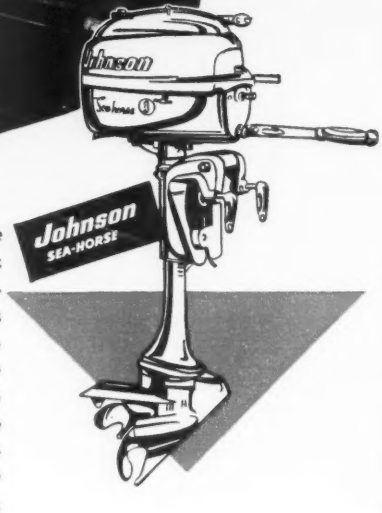
62 AJAX TAMA-WYATT *Induction Furnaces*—

help Johnson Motors produce millions of aluminum alloy die castings per year

Photo shows a part of the Aluminum Alloy Die casting Shop at Johnson Motors.

Johnson Motors, Division of Out-Board & Marine Mfg. Co., Waukegan, Ill., has the largest aluminum die casting plant in the world using exclusively electric furnaces for melting and holding the metal to be processed in die casting machines for the production of outboard motors.

AJAX Induction Furnaces have proved most satisfactory for this concern because they have automatic temperature control, gentle movement of the metal (which prevents segregation), and amazingly low maintenance cost. Some furnaces have been operating for as long as 7 years without renewal of refractory lining.



"The best holding furnaces for aluminum die casting machines are considered to be electric induction furnaces. Where ingot is being added directly to the furnace for die casting, this is the only furnace on which there is little possibility of sludge formation at the bottom. The reason for that is obvious. The heat is where it belongs, down at the bottom of the furnace *in the metal*. Also, the agitation due to the internal electrical stirring, which has no effect on dross inclusions, gives the best conditions for holding furnaces (for either die casting or permanent molding), especially if it is desired to add pig directly to the furnace."

From answer to "Quizmaster" question, provided by technical service staff of Federated Metals Div., American Smelting & Refining Co. in March, 1953 issue of American Foundryman.

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AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

(*Continued from page* 178)

that the breakdown on costs has not been completed. However, he believes there is no better way for the malleable industry to increase sales than to look at the shell molding process. This need not take business away from green sand production, but may, as he indicated has happened with his company, draw inquiries for casting to replace other types of fabrication.

Bernard N. Ames, supervising physical metallurgist, Brooklyn Navy Yard, Brooklyn, N. Y., stated that no foundry can afford not to take a hard look at shell molding, provided quantity production of accurate castings is required. He advised starting with a single, manually operated dump box and any oven that can attain 600° F. Pattern equipment need not be elaborate and it is not necessary to start from scratch. Considerable information has been presented in the technical press, and manufacturers of equipment and supplies are ready to help. Mr. Ames indicated that a foundry starting such production will be deluged with inquiries for shell molded castings, and 90 per cent of these should not be produced in shell. Metals and types of castings adaptable to production in shell were outlined by Mr. Ames.

May Need Redesigning

Frequently the redesign of the part will increase the desirability of producing in shell molding, according to the speaker. Conservation of materials normally removed by machining, and of alloys which are difficult to machine, are factors which may recommend adoption of shell production. In conclusion, Mr. Ames stated that shell molding is not a panacea for all foundry ills. In his opinion, the process will replace only a small percentage of sand casting, but, if properly applied to the right jobs, can be a sound and economic tool.

Shell molding is an inexpensive process for making high grade dry sand molds, according to Walter Sokolosky, Plastics Division, Monsanto Chemical Co., Springfield, Mass. If it were possible to reduce substantially the cost of dry sand molds, many more castings would be made in them. Also, if such a cost reduction were possible, the foundry industry would have an easier job in selling its product. The speaker stated that the cost of shell molding in many cases can be competitive with green sand molding.

Mr. Sokolosky said that close dimensional control and excellent and reproducible finish are two outstanding features of shell molded castings from the standpoint of saleability. New techniques are being developed for further increasing the utility of the process, the most promising being a new technique for coating sands with resin. Coated sands increase the efficiency of resin-sand mixes to such a degree that approximately 25 per cent less resin can be used in each shell mold. This reduction in cost should prove advantageous to furthering the shell molding process.

Ray Sutter, president, Sutter Products Co., Dearborn, Mich., described two types of shell molding equipment, one a completely automatic multistation machine and the other a single stage unit. Mr. Sutter indicated that machines will be developed to meet the needs of the process as these progress. The shell molding discussion concluded with the showing

(*Please turn to page* 271)

SUCCESSFUL CONVEYOR INSTITUTE

Covers Materials Handling Techniques

By ROBERT H. HERRMANN
Associate Editor

FIRST national conveyor institute was held at the University of Illinois, Urbana, Ill., Apr. 14-16. It was conducted by the Department of Mechanical Engineering in co-operation with the Conveyor Equipment Manufacturers Association, Washington. Attendance totaled 282, not including students who were dismissed from class to attend sessions pertinent to their fields of study.

Subjects on the institute program were divided into four groups covering bulk handling of medium to heavy materials, bulk handling of light to medium materials, unit handling of consumer goods and unit handling of durable goods. Panel members at each of the sessions outlined various phases of the subject under consideration, balance of the time being devoted to discussion among those attending the sessions and panel members.

The importance of giving serious attention to materials handling techniques was emphasized at the opening general session by R. C. Sollenberger, secretary, CEMA, when he pointed out that 25 to 30 per cent of production costs are those of handling materials. He went on to say that the intelligent design of new manufacturing facilities should involve planning the handling and production systems first, then constructing the building around them. Such an approach might dictate the use of a number of buildings interconnected by materials handling equipment rather than the placing of all production and processing facilities in one building, as has been customary procedure.

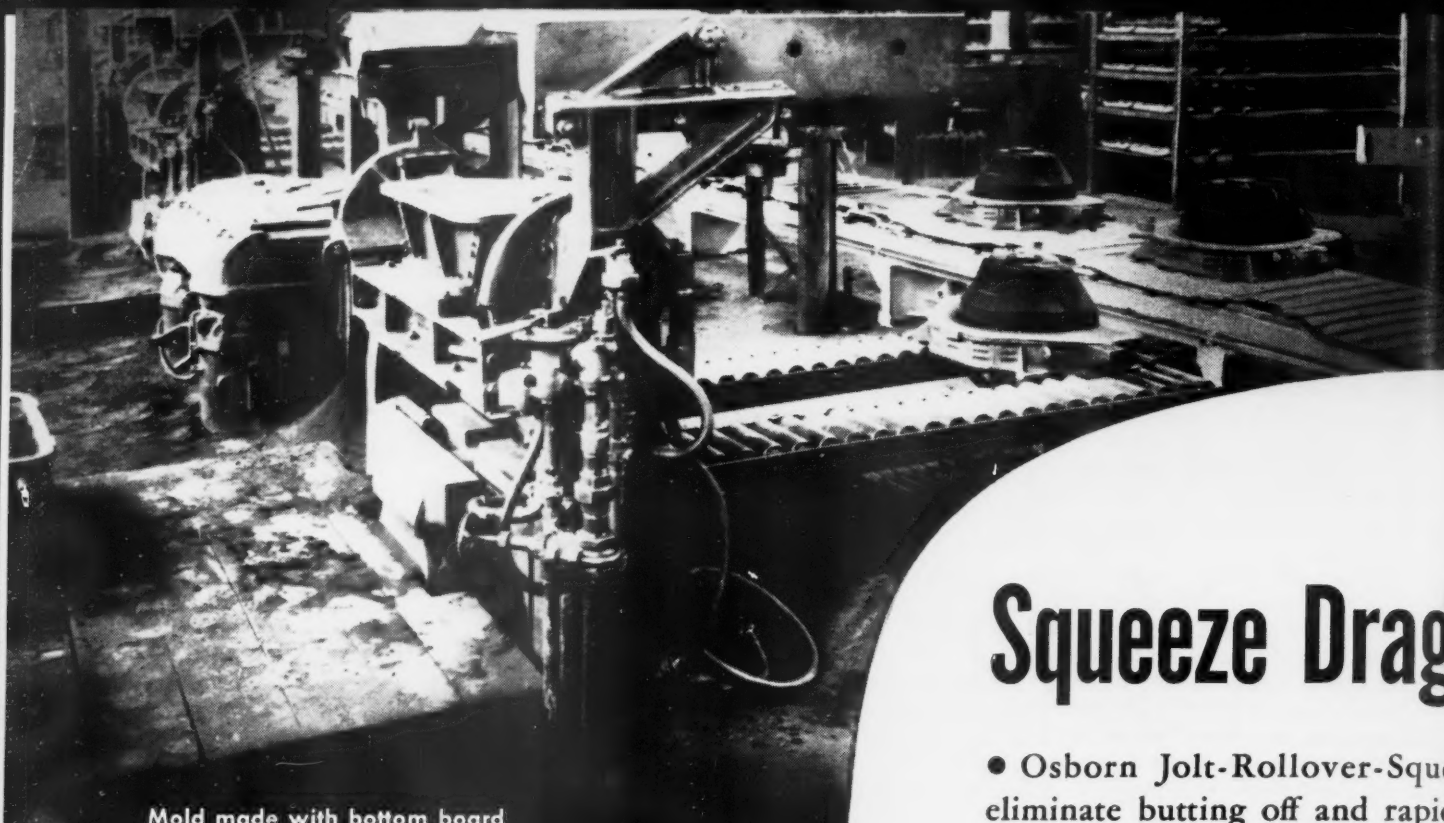
Discussion in subsequent sessions brought out the fact that conveyorization offers advantages in economy, fast handling of large quantities of materials, greater worker safety, increased productivity at reduced worker fatigue, proper timing of flow to meet production operations, conservation of space and in providing visible, moving materials storage. Conveyorization also contributes to improved and more uniform product quality, except when conveyor speed is excessive, requiring too fast a processing pace.

It was suggested that in planning a proposed conveyor installation, all phases of the materials handling problem be analyzed from receipt of materials through processing to delivery of the product. In addition to direct costs, considerable attention should be given to indirect costs. The total cost then should be weighed against manual handling expense.

Next step is to consider if the conveyor system can be integrated with existing handling facilities. Furthermore, a plant-wide, overall plan should be developed so that the proposed installation will be complementary to future systems.

Mechanical controls for sequencing operations in the highly mechanized plant were recommended because of their comparative simplicity and the fact that most maintenance men understand them. Such controls make use of limit switches to actuate pneumatic cylinders or other devices for moving equipment, opening gates and performing similar operations.

In modern, automated plants conveyors set the pace of production, with the result that time study values assigned to worker operations do not fit into the automation picture. Incentive systems are based on departmental bonuses in such highly mechanized plants or operations. Automation was defined as the automatic handling of parts and supplies in continuous, progressive processing. Emphasis was placed on the increased amount of maintenance work, particularly preventive maintenance, required in automated plants.



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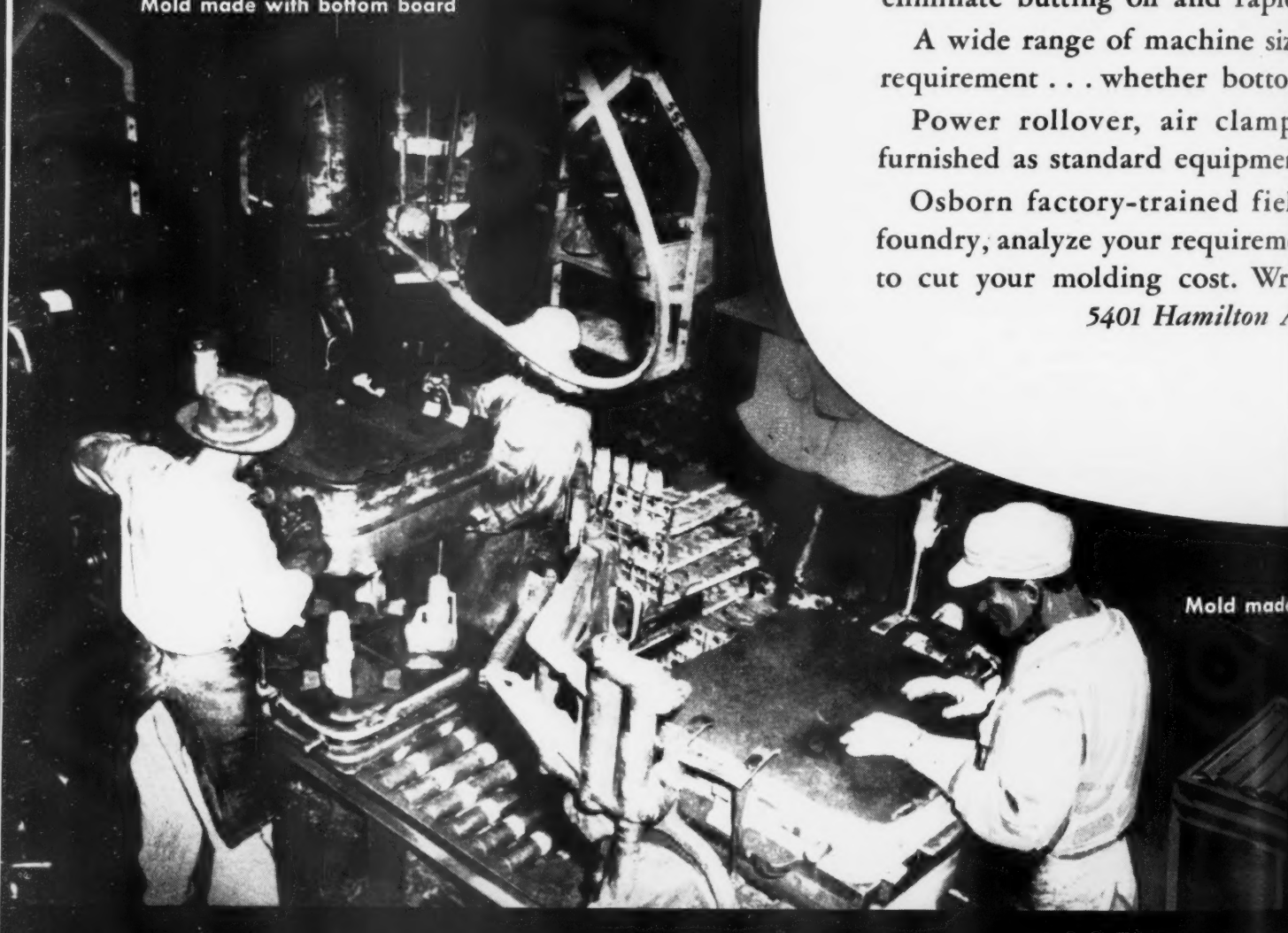

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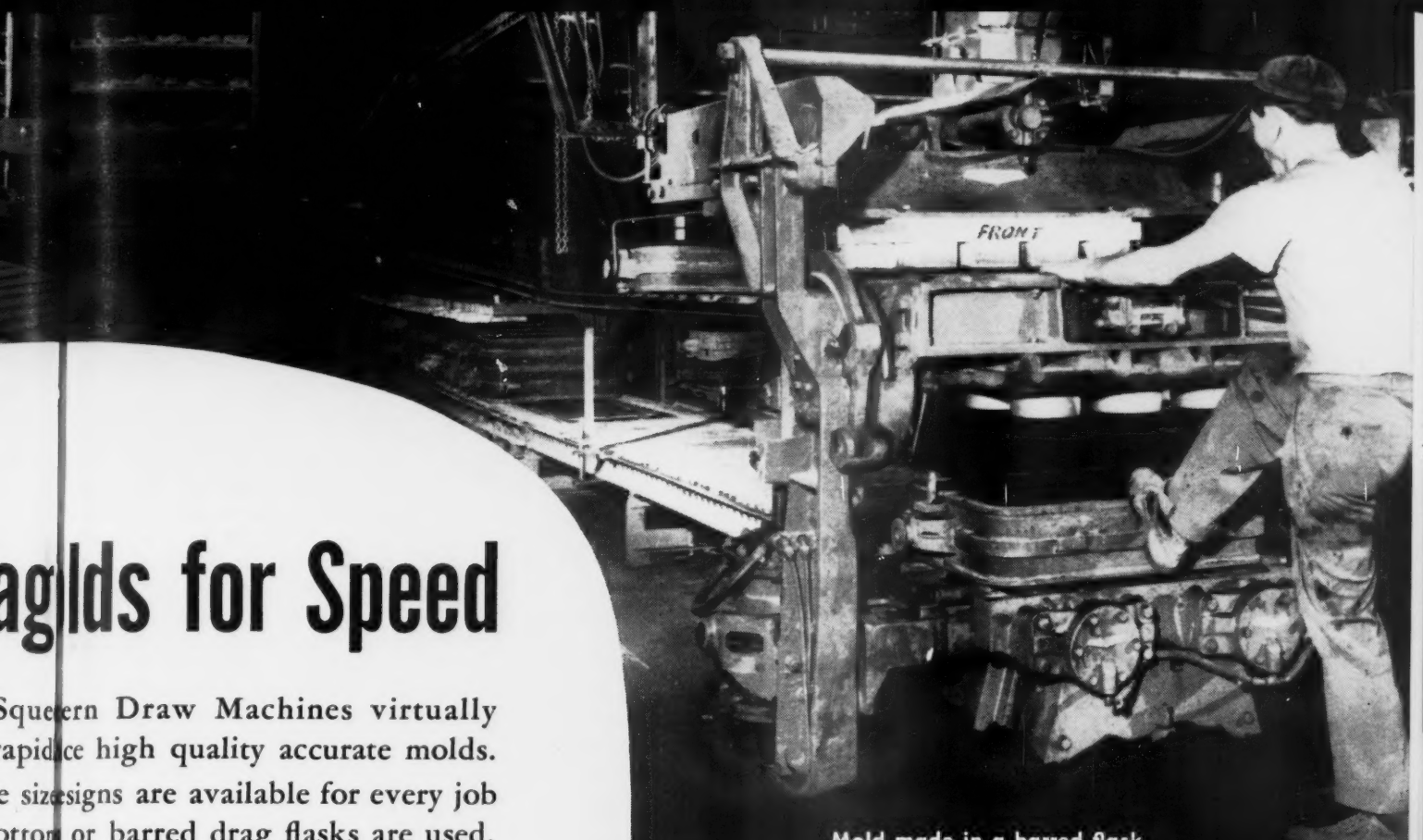
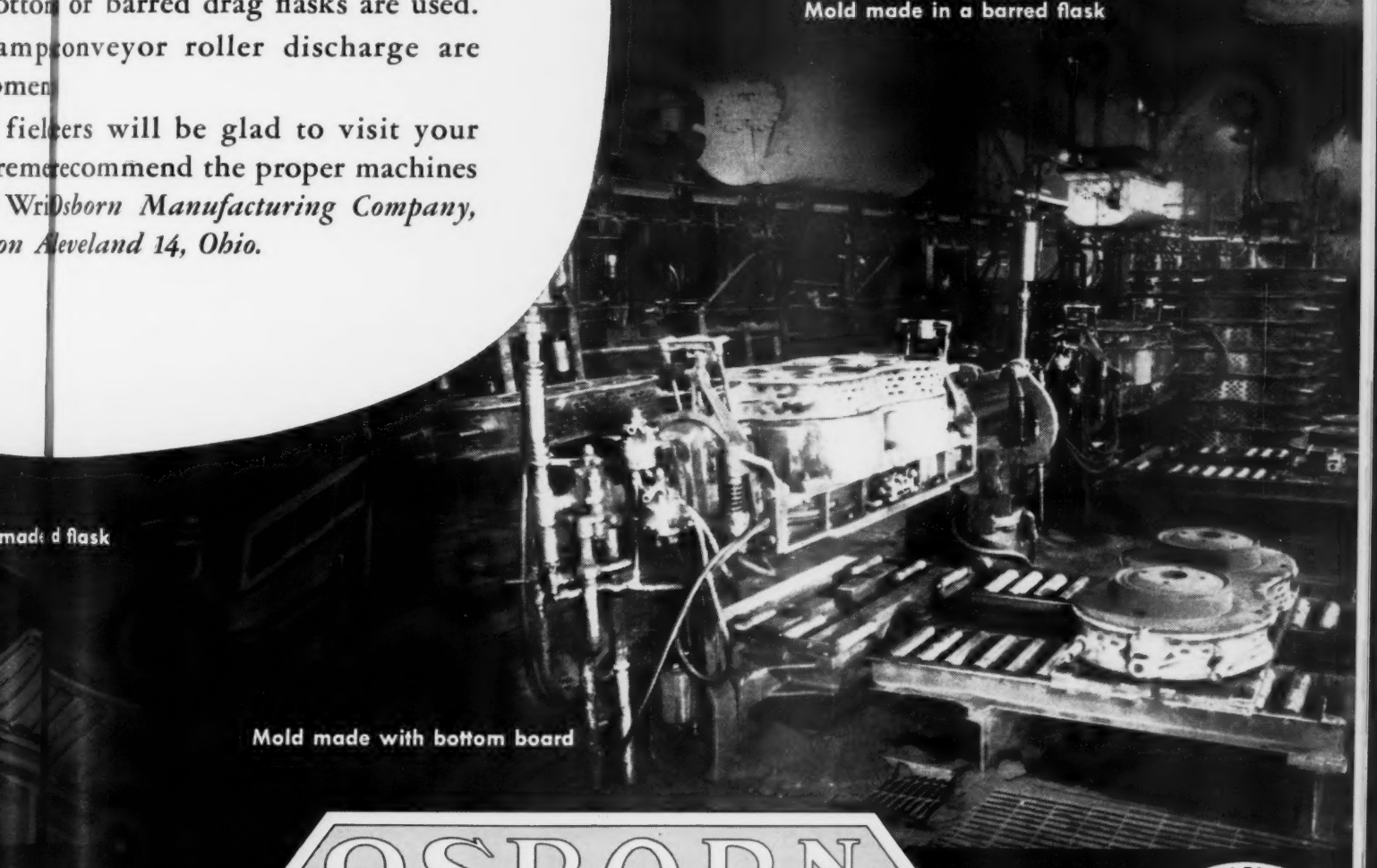


Mold made in a barred flask

made d flask



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NATIONAL OPEN-HEARTH CONFERENCE

Discusses Operating Problems and Solutions

By EDWIN BREMER
Metallurgical Editor

THIRTY-SIXTH conference of the National Open Hearth Committee, American Institute of Mining and Metallurgical Engineers was held at Hotel Statler, Buffalo, Apr. 20-22 with 1110 registered attendance.

New officers elected for the forthcoming year include L. R. Berner, Inland Steel Co., East Chicago, Ind., chairman, and L. A. Lambing, Jones & Laughlin Steel Corp., Pittsburgh, vice chairman. J. J. Golden, United States Steel Co., Pittsburgh, becomes past chairman, and Ernest Kirkendall, AIME, was re-elected secretary-treasurer. The 1954 conference is scheduled for the Palmer House, Chicago, Apr. 5-7.

Make Several Awards

At the annual fellowship dinner Tuesday night the following presentations were made: *Journal of Metals* award to F. M. Stephens Jr., Benny Langston and A. C. Richardson, all of Battelle Memorial Institute, Columbus, O., for their paper "Reduction-oxidation Process for the Treatment of Taconites"; Certificate of Recognition and lifetime membership as well as a clock to A. H. Sommer, Keystone Steel & Wire Co., Peoria, Ill. for his long and active service; McCune award to Joseph H. Flaherty, Jones & Laughlin Steel Corp., Pittsburgh, for his paper "Quality Production of High Sulphur Steel", and the Conference award to A. W. Fastabend, American Steel Foundries, East St. Louis, Ill., for his paper "Effect of Reduced Aluminum Deoxidation on Cast Steel".

In a session on acid open-hearth operation with C. F. Christoper, Continental Foundry & Machine Co., East Chicago, Ind., and D. L. McBride, U. S. Steel Corp., Pittsburgh, as chairmen, Douglas C. Williams, Ohio State university, Columbus, O., presented a paper on sand for open-hearth bottoms in which he pointed out that little information is available in the literature on which to base even tentative specifications.

He said sand grain shape does not appear to be a factor in the rate of fusion, but the diameter of the grains apparently is the dominating factor. To speed fusion, at least 20 per cent finely divided material must be present. The B-sintering test (AFS) may be a valuable tool in predicting behavior of acid open-hearth sand mixtures.

J. B. Kopec, Acid Open Hearth Research Association Inc., Pittsburgh, discussed sand bottom repair from data obtained from 22 plants. Total time for the operation was related directly to the quantity of repair sand per heat and the amount of time used by furnace operators in "setting" or fusing in the sand. Latter seems to be the deciding factor as to whether or not a given furnace has excessive bottom repair time.

In a session held Monday afternoon with H. B. Emerick, Jones & Laughlin Steel Corp., Pittsburgh, and J. L. Walton, Bethlehem Steel Co., Lackawanna, N. Y., presiding, Harold Gaw, Armco Steel Corp., Middletown, O., presented a paper prepared by A. H. Osborne of the same firm in which it was pointed out that electric furnace steel contains 0.002 per cent more nitrogen than open-hearth steel, and hence has higher hardness. Use of more pig iron in electric furnace charge reduces nitrogen content. For example, addition of 25 per cent pig reduces the N from 0.005-0.006 per cent to 0.002 per cent. Electric furnace melting has an advantage in that Pb and Zn can be reduced by electrode dipping, and instances were cited of reducing Pb content from 0.021 per cent to 0.006 per cent by that practice.

Compare Steel Qualities

B. R. Queneau, U. S. Steel Corp., Duquesne, Pa., stated that with proper precautions the qualities of electric furnace steel are about the same as for open-hearth steel. In a discussion of thermocouple bath temperature measurements, J. H. Richards, U. S. Steel Corp., Pittsburgh, stated that cost of reading by that method was about $1.18 per reading, and that three readings per heat were taken. T. B. Winkler, Bethlehem Steel Co., Lackawanna, N. Y., said cost in his plant was $1.60 a reading.

Loren B. Wright, Symington-Gould Corp., Depew, N. Y., and J. E. Wilbanks, Atlantic Steel Co., Atlanta, Ga., presided over a session held Tuesday afternoon on cold metal and basic foundry practice. In a discussion of economics of electric furnace vs open hearth, T. R. Scott, Sheffield Steel Co., Houston, said that electric furnace costs are higher for carbon steels, but lower for alloy steels in his plant.

Mr. Wilbanks stated he found that electric furnace steel costs less than open hearth due to lower labor and fuel cost. Electric furnace steel is produced with 507 kwh per ton with consumption of 9.2 lb of electrode. Yield for electric furnace is 94 per cent against 89 per cent for open hearth. Electric furnace practice provides higher available operating hours, and repair cost is lower than for the open hearth. Clarence King, Sheffield Steel Co., Kansas City, Mo., pointed out that in his plant the high cost of electric power and certain other factors bring the cost of electric furnace steel to $5.08 per ton higher than for open-hearth steel.

Discuss Aluminum Deoxidation

A. W. Fastabend. American Steel Foundries, East St. Louis, Ill., discussed effect of reduced aluminum deoxidation on cast steel, and said that the reduction in combination with ferrotitanium gives much better results than the usual 2 lb of aluminum per ton, since lower porosity and tearing results. However, when the steel contains 0.30 per cent or less C, the aluminum has to be increased slightly.

C. F. Henzelman, Granite City Steel Co., Granite City, Ill., pointed out that to produce quality steel it is necessary to see that a good spout is prepared, and when the tapping plug is removed it is swept away and does not enter the ladle. Ladle should be lined properly with as thin joints as possible, and it should be kept clean. Also, attention should be given to the stopper rigging to insure that it is in proper operating condition.

H. C. Paxton, Lukens Steel Co., Coatesville, Pa., substituting for his co-worker, R. R. Fayles, described some applications of rammed and castable refractories. He said plastic chrome refractory gives considerable increase in open-hearth door life.

R. C. Buehl, Bureau of Mines, Pittsburgh, described a method of recarburizing steel heats by injection of powdered coke or anthracite with

(*Concluded on page* 187)

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Complete lining in reverberatory furnace used to melt brass for plumbing fittings	B&W Allmul gave equal life—cost 30% less than special kyanite refractory previously used
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Uptake arches of two continuous weld pipe furnaces. One furnace handles pipe up to ¾", and the other up to 4½"	B&W Allmul lasted 3 times as long as kyanite refractory previously used
Complete linings of indirect arc furnaces melting various alloys with pouring temperatures from 2700 F to 3100 F	B&W Allmul lasted 2 to 3 times as long as previous refractory—and cost about the same
Roof of direct arc furnace which handles stainless steel—pouring temperature of 3100 F and higher	B&W Allmul lasted 3 times as long as super-duty brick

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R 467

(*Concluded from page* 184).

compressed air. Injection is through a 2-in.-diam graphite tube with a ½-in. bore, using compresed air at 45 psi at the rate of 1 cu ft air per pound of material. Carburizing efficiency was found to be 56 per cent in the range 0.2 to 1.5 per cent C in the steel. Efficiency is influenced by iron oxide in the slag, and when over 20 per cent, more carburizing agent is required to reduce it to that value.

In the discussion, R. R. Fayles, Lukens Steel Co., Coatesville, Pa., stated that a number of years ago he had tried a similar method, using graphite as the agent, but so much trouble was encountered that the procedure was abandoned. Troubles included breaking off of the graphite tubes, development of considerable flame and badly foaming slag. He pointed out that the experiments were carried out in a small open-hearth furnace (5-ton) at the Bureau of Mines which had a small shallow bath, compared with a 50 or 100-ton production furnace.

Publish Report of Armour Research Foundation

News of scientific contributions to industry, national defense and the public highlight the 64-page annual report of Armour Research Foundation of Illinois Institute of Technology. More than 275 of the 397 research and development projects undertaken by the foundation's staff of scientists and engineers are described. The full-time staff totals 1074 persons, 712 of whom are directly engaged in research activities.

Sponsored by industry, governmental agencies and by the foundation itself, the projects represent an expenditure in excess of $8 million, a 30 per cent increase over that of the previous year. Representative projects include intensive research on titanium and its alloys monthly dustfall analyses for Chicago's smoke inspection and abatement department, and the development of a lightweight aggregate that makes concrete mixes easier to handle.

Use of Metal Abrasives Covered in New Book

Metals Disintegrating Co., Elizabeth B, N. J., recently has published a loose-leaf book entitled *MD Blue Book*. In addition to a brief history of the company's development, a description of its present facilities and a listing of its plants and service organizations, the book contains technical sections on metal abrasives, metal pigments, metal powders, reference data, technical bulletins and other materials.

Of particular interest to foundrymen is the discussion of manufacture and use of shot and grit for castings cleaning. Tables show sizes recommended for various cleaning operations. Included in the discussion are cast iron, cut-wire steel and cut-wire copper shot.

Technical bulletins are included on SAE specifications, abrasive size range and screen tests, importance of average particle size, testing equipment and the use of shot as weighting or back-up material for shell molds.

Industrial Heating Leaders Win Trinks Award

THE annual Trinks Award for outstanding contributions to the scientific and economic progress of the industrial heating industry was presented to four men at a banquet May 5 at the Duquesne Club, Pittsburgh.

Recipents were: Carl F. Mayer, president, Carl Mayer Corp., Cleveland; Harry H. Harris, president, General Alloys Co., Boston; Carl I. Hayes, president, C. I. Hayes Inc., Providence, R. I., and J. Spotts McDowell, technical assistant to the president, Harbison-Walker Refractories Co., Pittsburgh.

CARL F. MAYER

HARRY H. HARRIS

The award, established in 1950 in honor of Dr. Willibald Trinks professor emeritus of Carnegie Institute of Technology and world authority on industrial heating problems, is bestowed annually among candidates nominated by the industry It is sponsored by the editors of *Industrial Heating*.

Mr. Mayer was honored for his pioneering development in industrial ovens, air heaters, furnaces and allied equipment for which he holds some 17 patents. Graduated from the University of Michigan in 1918, Mr. Mayer was vice president of Foundry Equipment Co., Cleveland, from 1930 to 1934, when he started his own business. The more than 30 technical papers and articles he has prepared on industry problems have won him recognition as an authority on industrial ovens. One paper, "A Study of Insulated Core Oven Design and Performance," was presented before the American Foundrymen's Society more than 30 years ago. He is a past president of the Smaller Business of America, a board member of the Industrial Furnace Manufacturers Association, and was an industry advisory committee member to the War Production Board. Mr. Mayer also is a director of the Swartwout Co., Cleveland.

Selection of Mr. Harris was based on his pioneering in heat resisting alloys and alloy casting designs for continuous furnaces; also for his recent service to the U. S. Navy and Air Force in directing research for improvement of castings, casting processes and jet engine components. A noted inventor, he is said to hold more patents on high-temperature tooling and furnace mechanisms now in general use than any other man.

Around the Country

NEWS REPORTS FROM

- Chicago
- Los Angeles
- Philadelphia
- New York

Chicago

IN THIS column in the April issue of FOUNDRY, p. 148, it was reported that nonferrous foundry owners and operators in this area had conferred with police officials in their efforts to halt thefts of metals and alloys from their plants. Such thefts had reached serious proportions.

Despite increased vigilance, the thefts continued. Some shops were burglarized a second time. Metals taken included nickel, monel, aluminum, copper, brass and bronze ingots and scrap and sometimes finished goods or products in process. The depredations appear to be the work of a well-organized gang which implements its operations with special equipment.

The group of about 35 nonferrous foundries affiliated with the Chicago Chapter of the Non-Ferrous Founders' Society took the next step in self-protection when it sponsored the following two-column advertisement in the *Chicago Sunday Tribune*, May 3:

REWARDS to $2500.00
(at the sole discretion of the Committee)

The Chicago Area—Non-Ferrous Foundrymen will pay rewards to $2500.00 for information leading to the arrest and conviction of any person or persons feloniously breaking, entering or burglarizing our foundries, or stealing the products or property thereof, including the arrest and conviction of any person or persons who may be accessory to such crime. This REWARD will apply to Municipal, State or Federal enforcement of Criminal Codes and the prosecution of the party or parties convicted as aforesaid.

All information will be considered confidential.

In submitting information call FRanklin 2-3458; Chicago Police Department, POlice 5-1313.

Later each foundry contributing to the protection drive placed on the front of its establishment a placard carrying the same reward offer as the advertisement. The steps taken are regarded as holding promising possibilities for smoking out and apprehending the thieves.

* * *

Something out of the ordinary in dedication of a new building took place in late April when the Meta-Mold Aluminum Co., Cedarburg, Wis., opened a recently completed modern office building. A series of three open-houses—one for employees and their families, a second for specially-invited guests and the third for the public—featured an exhibition of contemporary art.

The exhibition created quite a stir in Cedarburg, a community of some 3000 people. Including more than 50 paintings by some of the greatest names in modern art, it was the idea of Otto L. Spaeth, company board chairman, and his wife, Mrs. Eloise Spaeth, a nationally-known collector of modern art. The two are said to be one of the outstanding husband and wife art teams in the country. They "commute" from their New York city home to Cedarburg.

Los Angeles

ANOTHER round of higher foundry wages, should it materialize, is almost certain to cause prices of casting to rise. Negotiators of the AFL International Molders, Coremakers and Foundry Workers, who are bargaining with six iron foundry managements concurrently, first asked 25 cents an hour additional, then scaled demands to 18 cents when foundrymen offered 7 cents.

Bargaining is following the pattern established by recent settlements in the Pacific Northwest where Seattle and Portland foundries granted an increase of 17 cents an hour and set $2.15 as the wage for molders and coremakers. As in northern negotiations the union is striving to reach agreements which will give coremakers wages comparable with those of machinists. Base wage of machinists here is $2.18.

Foundrymen point out that the desire of the union to peg foundry wages to machinists's scale is unrealistic. They say that the quality of machinists here is poorer than in northern districts. They further contend that the district foundry industry cannot withstand too great an increase in labor costs. And since local foundries have already so far this year advanced casting prices an average of 9 per cent due to higher labor costs, another increase in prices following so soon on the heels of the first, they say, may hurt foundry business to the point where working forces may have to be reduced.

Local foundry leaders agree with the unions that wages are too low and so far this year have granted an increase of 7 cents an hour. But in their demands for still higher wages labor may be out of step with the pace of foundry business prospects, say foundrymen.

Castings volume has contracted about 15 per cent since the first of the year, and only steel foundries can be called "busy." Backlogs, however, are slightly higher. Ferrous jobbing foundries have orders for five weeks compared with four weeks in January. Patternshops report higher activity with interest distributed among all industries — petroleum, aircraft, plumbing, and agricultural.

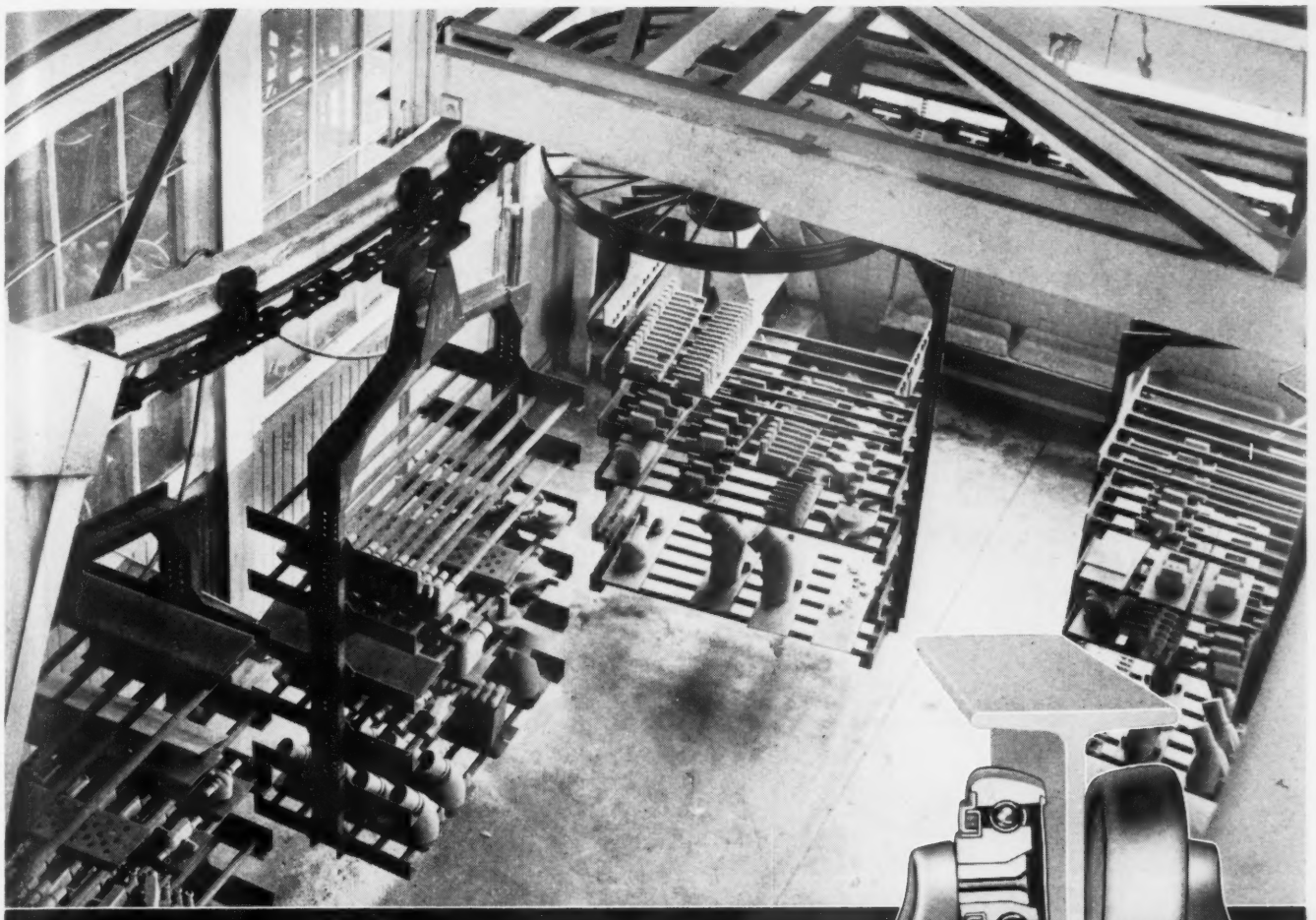
Supplies of pig iron and scrap are plentiful. Columbia-Geneva Steel Division has shut down a blast furnace at Ironton, Utah.

Philadelphia

GRAY IRON foundry operations are a little better than holding their own, but at an average rate that is proving generally disappointing, considering the season of the year. District pipe shops so far have shown little gain, despite more favorable building conditions. This is ascribed in part to increasing competition from southern pipe shops. Lag in machine tool requirements also is having an adverse effect on general gray iron foundry operations. Backlogs are light. However, most jobbing shops are operating at five days a week.

While incoming orders are not as heavy as they were, steel foundries are still operating at a good clip, with backlogs around 12 to 14 weeks. Defense work, especially tanks, is going far toward bolstering steel casting pro-

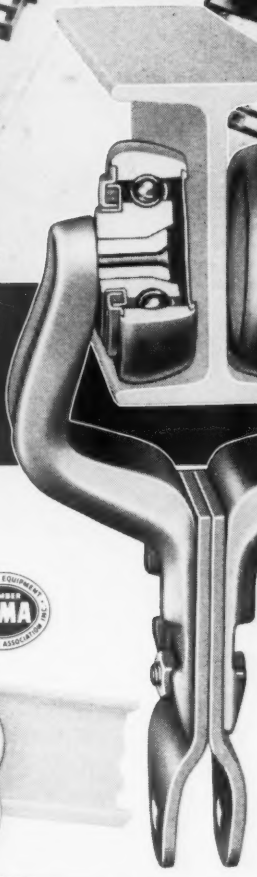
(*Continued on page* 191)



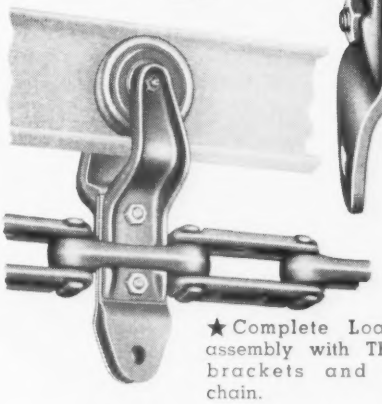
meet the bright new MATHEWS LOADSTAR

a spectacular performer in the fine trolley field

★ Here is a completely new trolley conveyer designed to meet the requirements of the most exacting purchaser. A top-quality precision wheel, the No. 4207 Loadstar is the heart of this rugged newcomer to the 4" trolley conveyer field. Five years of research and development by Mathews Engineers are behind this exceptionally fine trolley which is recommended for the overhead conveying job demanding stamina and continuous, trouble-free performance. Write for Bulletin LS-1, announcing and describing this new trolley.



★ No. 4207J Loadstar wheel, cutaway showing felt and steel seal.

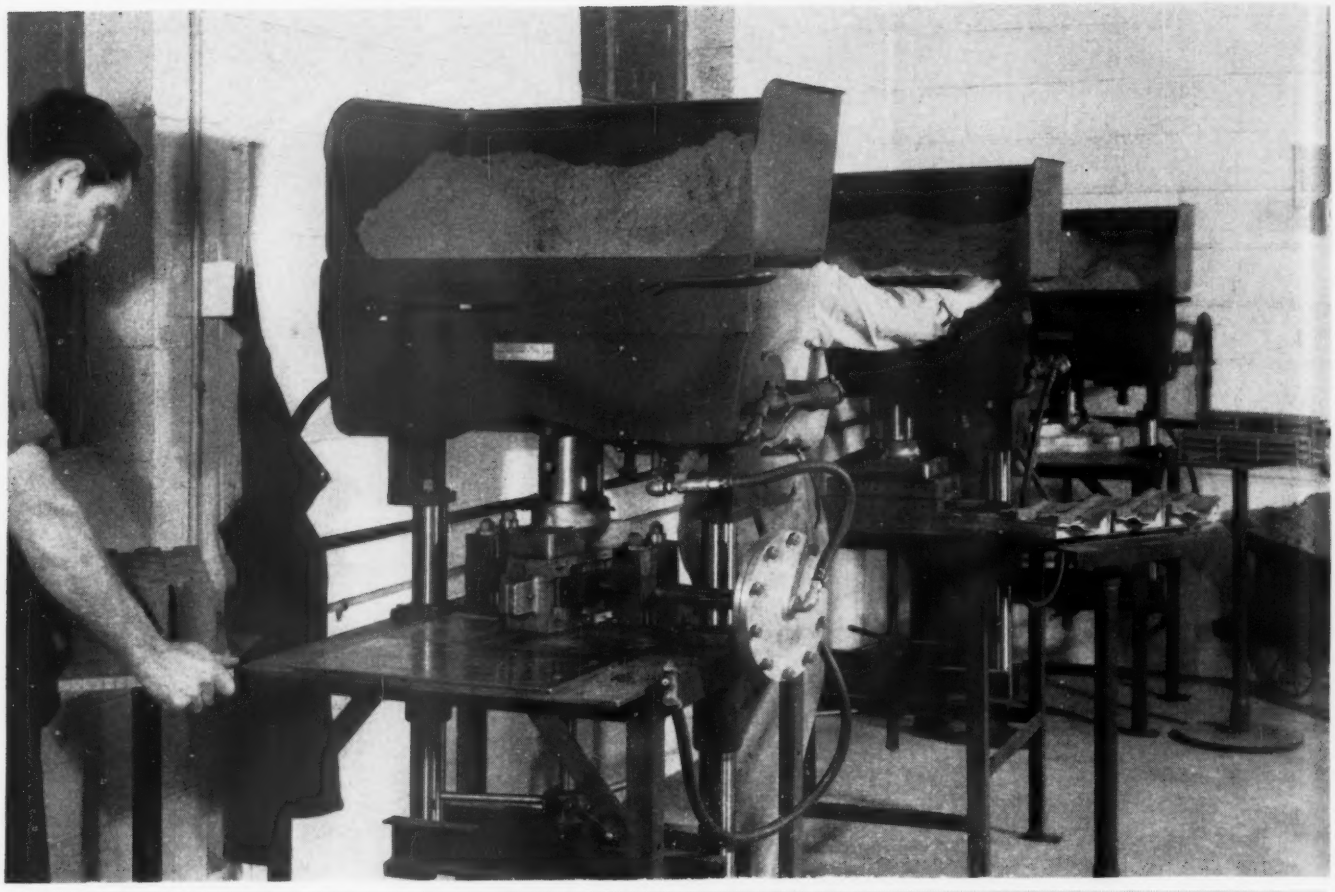


★ Complete Loadstar assembly with TB-4351 brackets and X-458 chain.

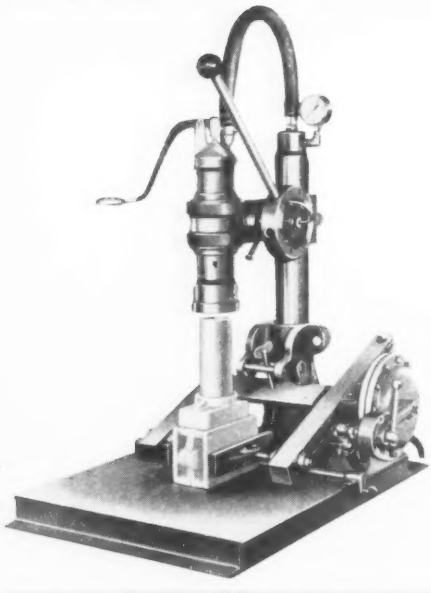
MATHEWS CONVEYERS

GENERAL OFFICES *Mathews Conveyer Company* . . . . Ellwood City, Pennsylvania
PACIFIC COAST DIVISION *Mathews Conveyer Company West Coast* . . San Carlos, California
CANADIAN DIVISION *Mathews Conveyer Company, Ltd.* . . . . . Port Hope, Ontario

Engineering Offices or Sales Agencies in Principal American and Canadian Cities



REDFORD *No. 2 Stationary Magazine Type* CORE BLOWER



NEW features and functional design permit maximum production with a minimum of effort . . . Accepted in hundreds of foundries as the most efficient machine for the production of cores up to 5 lbs.

Write for Specification Bulletin "F".

Redford Cartridge Type Bench Core Blower

- The original small core blower.
- Proven simplicity—Speed and Flexibility.
- Makes cores up to 2 lbs.
- Thousands in use.
- Write for Bulletin "G".

REDFORD
IRON & EQUIPMENT CO.
20733 Glendale Detroit 23, Mich.
Phone KEnwood 1-8611

(*Continued from page* 188)

duction. Malleable foundry output, however, still lags. Not much automotive business has worked its way into this area, and railroad equipment requirements, according to malleable producers, are spotty. Agricultural equipment needs are seasonally active and are contributing toward a general maintenance of malleable business on the scale of the past several weeks.

Brass shops are experiencing a pickup in demand for valves and bushings, especially for oil refinery work; and, in general, business is fairly good. Light metal shops are very busy, due particularly to aircraft requirements.

A SPOTTY situation prevails among foundries here. Some gray iron shops are doing all right, but in general operations are off, if anything. Some shops are back to a four-day week after having barely touched five days a week earlier in the spring. Steel foundry business is less active, although operations are being fully maintained, with backlogs amounting to about three months' work.

Brass and bronze jobbing shops are having to dig for work, and in most cases without too much success. Only the captive shops appear to be able to maintain a good rate of operation and this is not universally true either. Maritime needs continue to decline and this is adversely affecting some captive foundries. Light metal shops are doing well as a result of defense demands.

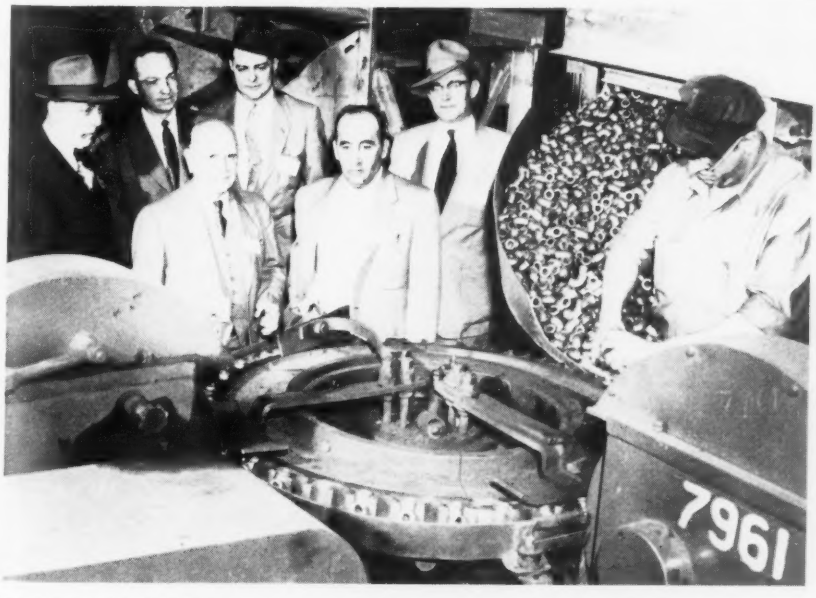
Raw materials are in ample supply. This is particularly true of such tonnage items as pig iron and scrap.

Institute of Metals Holds Meeting

New officers elected at the annual meeting of the (British) Institute of Metals held in London, England, Mar. 23 to 26 are as follows: President, F. C. Thompson, professor of metallurgy, University of Manchester; vice presidents, C. J. P. Ball, Magnesium Elektron Ltd., and G. V. Raynor, professor of metal physics, University of Birmingham; members of the council, W. A. Baker, British Non-Ferrous Metals Research Association; J. C. Colquhoun, Manganese Bronze & Brass Co. Ltd.; E. R. Gadd, Bristol Aeroplane Co. Ltd., and John Grimston, Enfield Rolling Mills Ltd. The council elected Dr. S. F. Dorey, Lloyd's Register of Shipping, as senior vice president for 1953-54, and next nominee for the presidency of the group.

Sir Christopher Hinton, Atomic Energy(Production), Ministry of Supply, presented the May Lecture on "Present and Future Metallurgical Requirements of the Chemical Engineer." Institute of Metals Platinum Medal for 1953 was awarded to Prof. Georg Masing, University of Gottingen, Germany, in recognition of his outstanding contributions in metallography; the Rosenhain Medal for 1953 was presented to Dr. Charles E. Ransley, British Aluminum Co. Ltd., for his notable experimental and theoretical work on gas-metal equilibria. John F. Waight, West Midlands Gas Board, received the W. H. A. Robertson Medal for 1952 for his paper on "Gas Equipment for Thermal Treatment of Nonferrous Metals and Alloys". Student Essay Competition prizes for 1952 were presented to R. D. Stacey, University of Birmingham, and to G. Thomas, Cambridge university.

In the technical sessions the papers and discussions were concerned with wrought nonferrous alloys, and included a symposium on "Control of Quality in the Production of Wrought Nonferrous Metals and Alloys. Part I—Control of Quality in Melting and Casting". Other phases considered in technical meetings were corrosion of alloys, and creep and plastic deformation.



PLANT VISITATION during the AFS convention brought 316 foundrymen into the malleable and brass foundries of Crane Co.'s Chicago Works. The malleable foundry was revamped completely last year. The group above is watching an automatic grinder remove gates from malleable iron elbows

Steel Castings Booklet Reports Cover New Alloys

Data on the reliability, strength and versatility of steel castings as an engineering material are presented in a booklet, "Carbon and Low Alloy Steel Castings," prepared by Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15. It details steels casting properties, specifications, design, joining, heat treating and inspection procedures, and classifies general engineering types of steel castings by tensile strengths. Copies may be obtained from F. Kermit Donaldson, society executive vice president.

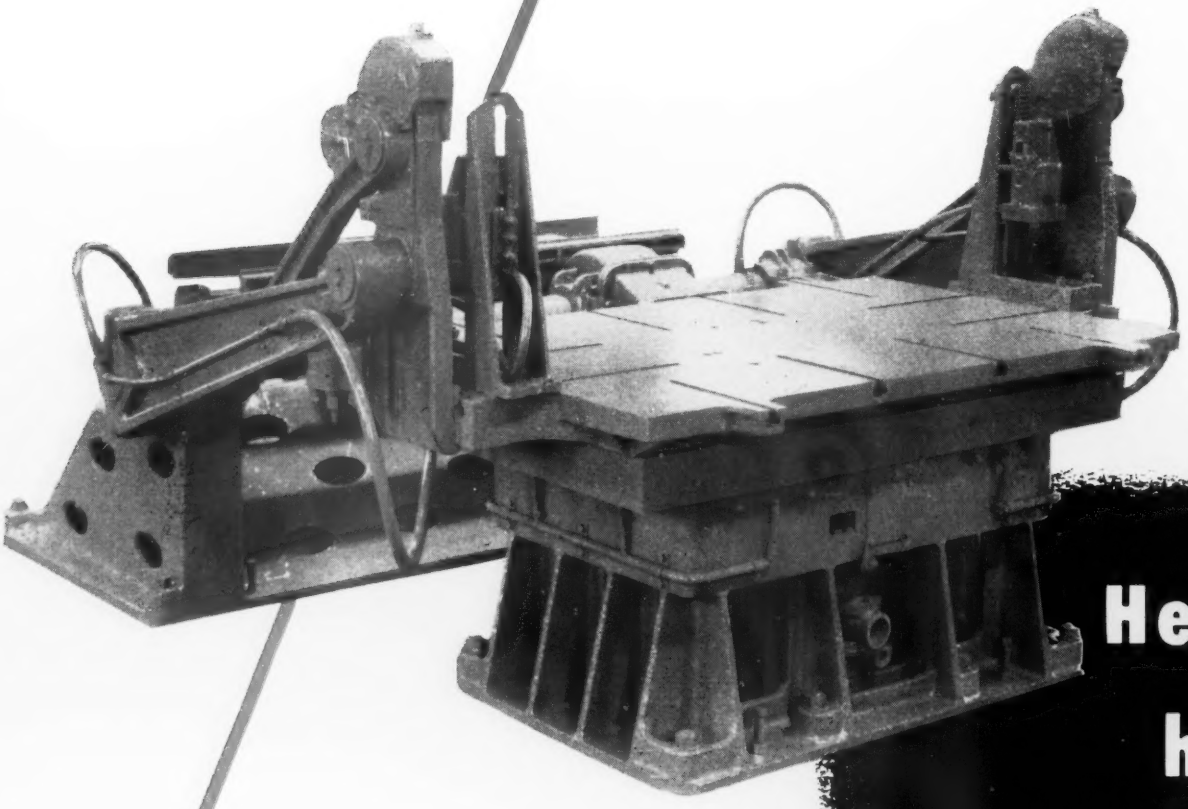
Book Review

Cellulose: The Chemical that Grows, by Williams Haynes, cloth, 386 pages, 5½ x 8½ in., published by Doubleday & Co., New York. Price, $4.

Intended to be a complete history of man's experience with cellulose, including both fact and legend, this volume relates the story of the cellulose industry from the age of Marco Polo to the present and records the paradoxical and complex qualities of the chemical. It is also the story of plastics, nylon lacquers, explosives and other products important to our time.

Mr. Haynes has included a concise glossary, a chronology of events and discoveries and appendixes of statistical and technical data that should be of value.

NO. 6 OF A SERIES



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The 6000 lb. Herman Jolt Rollover Machine illustrated is typical of our heavy duty line ranging in rollover capacities from 3000 lbs. to 10,000 lbs.

Chief feature of these machines to bear in mind is that they are controlled by an air-on-oil principle, which absolutely eliminates any jerkiness in their operation.

Smoothness of *both* pattern draw and rollover action is assured because of this hydraulic control principle. These machines bleed to a stop smoothly and easily in a cushioned type action.

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Write us for more information today . . . there is a type and size HERMAN Molding Machine for all foundry operation.

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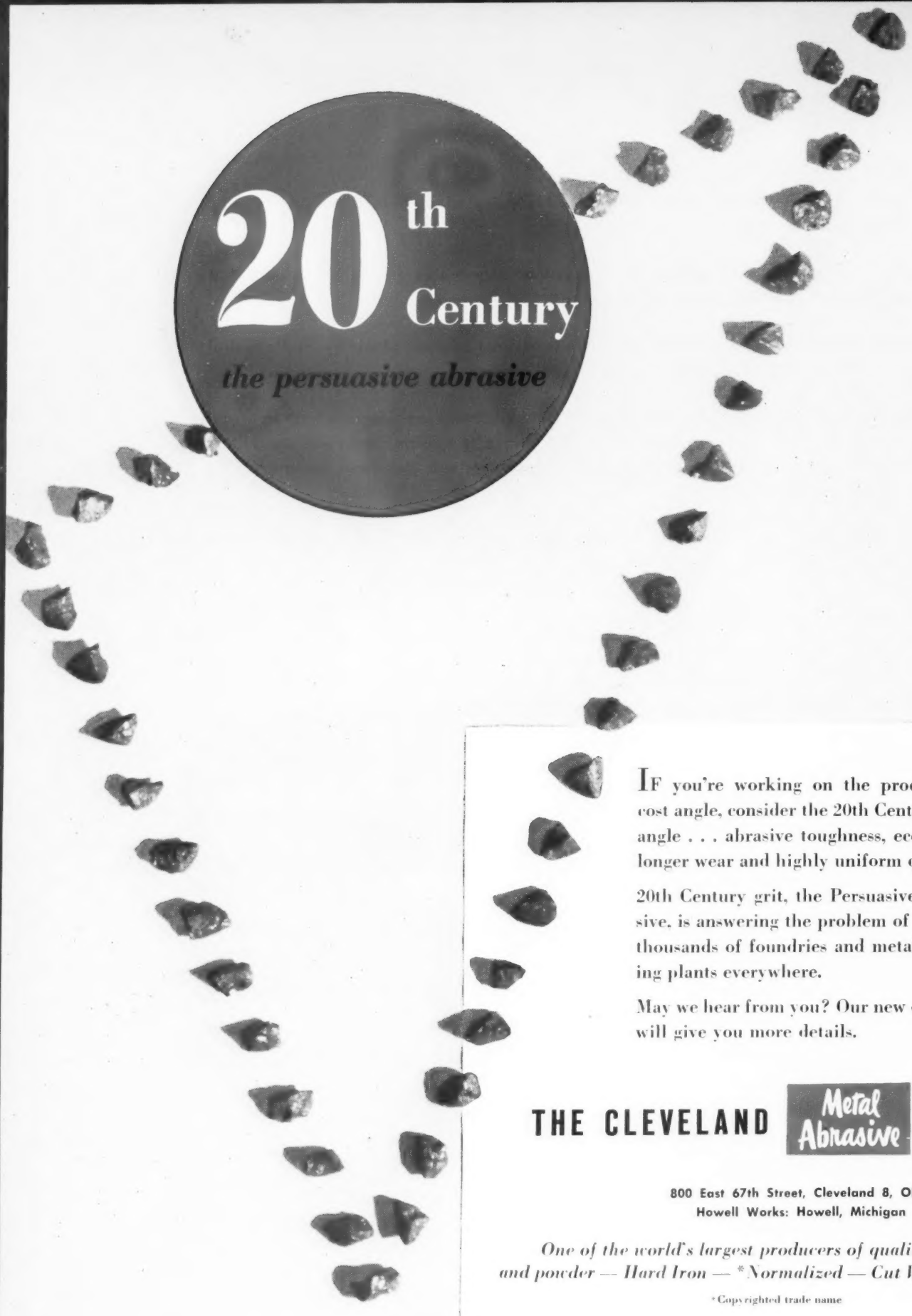
Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.



IF you're working on the production cost angle, consider the 20th Century triangle . . . abrasive toughness, economy, longer wear and highly uniform quality.

20th Century grit, the Persuasive Abrasive, is answering the problem of cost in thousands of foundries and metal-working plants everywhere.

May we hear from you? Our new catalog will give you more details.

THE CLEVELAND Metal Abrasive CO.

800 East 67th Street, Cleveland 8, Ohio
Howell Works: Howell, Michigan

*One of the world's largest producers of quality shot, grit and powder — Hard Iron — *Normalized — Cut Wire — Cast Ste*

*Copyrighted trade name

Foundry Statistics

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1951	1,085,241	656,076	.....
1952			
Feb.	82,898	50,129	193,061
2 mo.	169,901	105,117	.....
Mar.	80,960	49,084	196,896
Apr.	89,270	56,337	198,215
May	81,770	51,476	180,382
June	74,446	46,511	173,353
July	45,266	29,675	166,517
Aug.	63,716	39,308	162,832
Sept.	75,950	45,849	168,367
Oct.	88,062	52,922	168,609
Nov.	76,099	46,708	167,842
Dec.	80,680	50,485	173,494
Total	926,120	573,472	.....
1953			
Jan.	87,249	53,272	174,809
Feb.	86,515	51,963	175,088
2 mo.	173,764	105,235	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1951	550,433	206,671	172,729	157,756	.....
1952					
Feb.	44,847	17,451	13,445	13,012	110,327
2 mo.	91,271	35,502	25,681	26,896	.....
Mar.	46,448	19,017	13,673	12,880	104,749
Apr.	49,824	19,451	14,631	14,482	104,004
May	47,752	18,317	14,292	13,907	100,802
June	45,310	18,452	11,982	13,860	103,685
July	40,091	16,342	10,866	12,341	106,673
Aug.	46,761	18,477	12,397	12,884	112,852
Sept.[3]	45,430	16,733	12,515	15,888	127,777
Oct.[3]	51,631	17,826	15,191	18,284	132,624
Nov.[3]	46,483	15,419	13,463	17,372	138,461
Dec.[3]	53,343	17,277	16,191	19,608	146,499
Total[3]	564,344	212,813	160,882	178,402	.....
1953					
Jan.[3]	55,629	19,158	16,147	20,052	142,542
Feb.[3]	54,864	17,583	16,698	20,272	148,557
2 mo.[3]	110,493	36,741	32,845	40,324	.....

Copper-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1951	1,177,541	1,056,226	69,943	.....
1952				
Feb.	86,231	77,813	5,204	75,279
2 mo.	175,847	158,189	11,437	.....
Mar.	88,642	79,437	6,182	72,463
Apr.	84,460	75,590	5,914	70,602
May	81,903	73,723	5,420	70,252
June	75,359	67,748	4,858	70,797
July	64,762	58,931	3,637	74,739
Aug.	77,094	69,754	5,106	73,928
Sept.[3]	85,815	78,278	4,680	89,034
Oct.[3]	93,102	84,544	5,518	86,779
Nov.[3]	80,439	72,281	5,011	82,393
Dec.[3]	90,799	81,777	5,715	76,871
Total[3]	998,222	900,252	63,478	.....
1953				
Jan.[3]	85,781	76,686	5,388	80,793
Feb.[3]	85,183	76,847	5,061	76,578
2 mo.[3]	170,964	153,533	10,449	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1951	33,135	28,596	.....
1952			
Feb.	3,368	2,940	14,459
2 mo.	6,937	6,023	.....
Mar.	3,319	2,972	13,279
Apr.	3,051	2,751	13,244
May	3,002	2,698	13,041
June	2,948	2,699	12,094
July	2,654	2,393	12,948
Aug.	2,722	2,486	13,178
Sept.[3]	3,090	2,949	16,833
Oct.[3]	3,250	3,070	16,237
Nov.[3]	2,959	2,785	17,053
Dec.[3]	3,110	2,872	16,020
Total[3]	37,042	33,698	.....
1953			
Jan.[3]	3,073	2,825	15,680
Feb.[3]	3,225	3,033	14,834
2 mo.[3]	6,298	5,858	.....

Foundry Production Workers

Estimated Number

	Jan. 1953	Dec. 1952	Jan. 1952
Ferrous	240,600	240,700	246,300
Nonferrous	103,500	103,900	92,400

Average Weekly Earnings

Gray Iron	$72.06	$73.40	$70.98
Malleable Iron	75.27	76.61	70.68
Steel	81.43	82.76	77.28
Nonferrous	82.43	84.02	77.79

Average Weekly Hours

Gray Iron	40.3	41.1	41.8
Malleable Iron	40.6	41.3	40.0
Steel	41.8	42.4	43.2
Nonferrous	42.4	43.0	42.3

Labor Turnover Rate (Jan.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	4.0	3.5	2.4	0.4
Malleable Iron	4.2	3.2	2.2	0.2
Steel	3.6	3.8	1.9	1.0
Nonferrous	5.2	4.0	2.2	0.8

Source: Bureau of Labor Statistics

Gray Iron Castings—Shipments

(Net tons[1])

	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels		Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	For Sale	Total[4]	Total[4]	
1951	14,988,555	8,453,048	9,573,347	4,471,539	2,614,517	1,257,542	639,996	563,272	1,473,192	687,503	.....
1952											
Feb.	1,155,143	654,833	733,067	348,855	219,251	105,918	50,444	47,649	107,669	44,712	1,766,434
2 mo.	2,354,428	1,349,331	1,478,615	708,661	444,955	216,181	107,599	101,200	233,398	89,861	.....
Mar.	1,172,017	660,920	723,225	334,492	228,799	110,607	53,919	49,747	115,843	50,231	1,711,037
Apr.	1,204,801	652,962	773,538	347,121	204,805	85,239	48,506	42,650	117,929	60,023	1,614,426
May	1,100,630	620,049	698,332	317,150	186,998	91,980	44,229	39,848	117,586	53,485	1,459,305
June	835,263	502,322	616,895	292,846	19,467	10,575	44,066	44,066	103,335	51,500	1,445,521
July	636,141	431,889	427,475	227,794	14,794	10,223	40,783	40,783	96,784	56,305	1,409,684
Aug.	1,001,629	602,025	596,369	295,861	198,816	99,760	35,606	35,606	108,313	62,485	1,513,166
Sept.	1,119,373	625,680	676,732	309,299	230,219	107,987	39,912	35,884	107,847	64,663	1,450,723
Oct.	1,233,480	684,321	759,131	340,695	243,462	117,255	45,664	41,148	117,089	68,134	1,391,609
Nov.	1,060,735	590,334	649,316	296,674	218,349	104,035	41,655	38,210	99,196	52,219	1,309,252
Dec.	1,141,658	619,070	713,332	321,939	247,605	116,410	42,957	42,957	95,198	42,586	1,316,308
Total	12,860,155	7,338,903	8,112,960	3,792,532	2,238,269	1,070,252	544,896	512,099	1,312,518	651,472	.....
1953											
Jan.	1,161,945	622,392	730,216	324,330	252,181	118,514	38,385	38,385	93,930	47,233	1,333,255
Feb.	1,135,868	607,160	721,847	315,101	228,360	106,398	44,420	44,420	93,152	48,089	1,332,038
2 mo.	2,297,813	1,229,552	1,452,063	639,431	480,451	224,912	82,805	82,805	187,082	95,322	.....

Steel Castings—Shipments

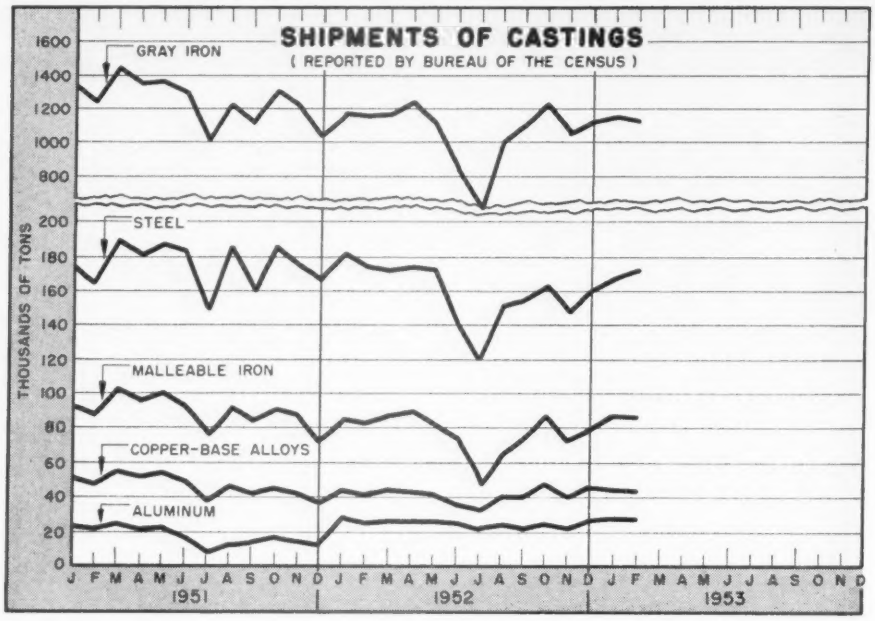
(Net tons[1])

	All Castings			Carbon Steel			Alloy Steel			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1951	2,050,054	1,506,903	466,172	1,541,280	1,162,687	415,915	508,574	344,216	50,157	.....
1952										
Feb.	174,626	133,602	31,719	125,484	94,969	28,251	49,142	38,633	3,468	856,872
2 mo.	358,364	273,090	68,810	259,469	197,234	60,057	98,895	75,856	8,753	.....
Mar.	173,694	131,997	32,118	125,787	95,206	27,782	47,907	37,196	4,336	857,115
Apr.	175,075	134,325	33,549	126,628	97,128	29,798	48,447	37,654	3,751	842,970
May	173,635	132,129	35,227	125,309	95,816	30,995	48,326	37,129	4,223	804,695
June	141,628	114,410	30,455	101,850	84,388	26,815	39,778	30,818	3,640	846,459
July	119,036	97,633	20,752	81,576	67,600	18,694	37,460	30,329	2,058	855,046
Aug.	150,232	113,997	24,498	107,203	80,877	21,626	43,029	33,120	2,872	809,354
Sept.	158,392	121,402	20,686	109,011	82,557	17,843	49,381	38,845	2,843	781,929
Oct.	165,155	124,626	23,590	116,201	86,584	20,611	48,954	38,042	2,979	772,949
Nov.	148,259	110,467	23,148	105,314	77,528	20,681	42,945	32,939	2,467	751,687
Dec.	161,733	122,166	26,728	114,146	85,809	24,046	47,587	36,357	2,682	719,203
Total	1,925,203	1,476,242	339,561	1,372,494	1,050,727	298,948	552,709	428,285	40,604	.....
1953										
Jan.	167,211	126,819	27,150	118,423	118,423	24,788	48,788	38,121	2,362	706,490
Feb.	175,675	137,592	33,156	122,624	94,991	29,828	53,051	43,495	3,328	644,302
2 mo.	342,886	264,411	60,306	241,047	213,414	54,616	101,839	81,616	5,690	.....

[1] Source: Bureau of Census. [2] For sale only. [3] Based on new sampling method; not comparable to prior figures. [4] All cast iron pipe is shipped for sale.

(Concluded on page 196)

FOUNDRY STATISTICS *(Concluded from page 195)*



Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1952	1953
Jan.	404.5	301.0
Feb.	200.4	257.3
Mar.	310.0	396.7
Apr.	385.1	.....
May	225.2	.....
June	353.8	.....
July	343.9	.....
Aug.	311.6	.....
Sept.	365.9	.....
Oct.	335.8	.....
Nov.	258.1	.....
Dec.	343.3	.....

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1951	79,133,744	78,868,124	3,664,404
1952			
Mar.	6,777,424	6,743,944	264,488
3 mo.	19,934,228	19,583,821	763,398
Apr.	5,806,153	5,770,711	261,972
May	5,961,757	5,882,713	253,605
June	2,472,940	1,772,203	219,909
July	2,376,019	1,621,308	166,377
Aug.	6,039,749	6,204,539	232,249
Sept.	6,180,804	6,517,682	269,029
Oct.	6,449,519	6,792,273	276,427
Nov.	6,316,660	6,418,639	252,805
Dec.	6,690,649	6,981,036	246,107
Total	68,230,693	67,876,964	2,955,241
[1]1953			
Jan.	6,761,201	6,884,585	248,557
Feb.	6,132,084	6,263,083	237,670
Mar.	6,839,741	6,879,940	275,542
3 mo.	19,733,026	20,027,608	761,769

Ingot Brass and Bronze

(Shipments in net tons)

	1952	1953
Jan.	28,315	24,423
Feb.	24,211	25,429
Mar.	23,890	28,256
Apr.	22,547	.....
May	21,740	.....
June	21,274	.....
July	18,947	.....
Aug.	21,807	.....
Sept.	22,770	.....
Oct.	25,811	.....
Nov.	23,441	.....
Dec.	22,983	.....
Total for year	277,736	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Totals	Shipments—For Sale	Unfilled Orders[2]
1951	494,950	328,183	.....
1952			
Feb.	34,307	23,006	70,034
2 mo.	64,334	47,980	.....
Mar.	35,083	23,443	67,846
Apr.	37,312	23,741	63,753
May	35,775	22,410	62,397
June	33,829	21,433	60,719
Total[3]	424,634	283,563	.....
1953			
Jan.[3]	45,941	30,702	88,440
Feb.[3]	46,583	31,761	91,800
2 mo.[3]	92,524	62,463	.....

Pig Iron Production and Consumption

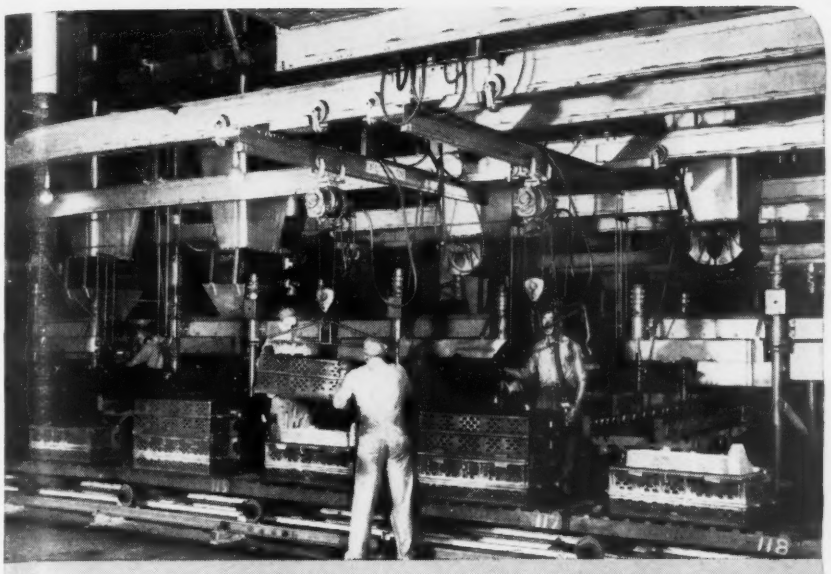
	Production** (Standard grades—1000 net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace, 1000 gross tons) Total	Cupola	Air	Electric
1951	70,264.5	3,186.2	3,169.0	55,134.1	8,774.8	63,760	5,731	354	136
1952									
Mar.	6,226.2	250.3	273.1	4,895.9	806.9	5,552	433	27	7
3 mo.	17,887.3	728.6	820.3	14,065.1	2,238.3	16,143	1,340	85	32
Apr.	5,170.0	243.8	218.5	4,069.9	638.0	4,714	446	28	8
May	5,414.2	245.4	236.0	4,295.6	637.2	4,823	412	25	8
June	1,043.2	133.7	103.1	758.6	47.7	991	342	20	5
July	981.6	119.7	118.3	712.9	30.7	845	250	12	8
Aug.	5,767.3	262.9	280.8	4,553.8	669.9	5,063	423	9	8
Sept.	6,069.3	294.7	306.6	4,757.0	710.9	5,363	417	21	9
Oct.	6,415.3	280.0	299.4	5,091.6	744.2	5,812	463	24	9
Nov.	6,138.9	262.0	315.4	4,842.6	718.8	5,472	397	21	12
Dec.	6,414.7	293.4	315.1	5,106.9	699.2	5,685	419	24	14
Total	61,306.8	2,864.2	3,013.3	48,254.0	7,174.9	54,911	4,909	269	113
1953									
Jan.	6,470.6	274.9	285.6	5,201.5	708.8	5,784	425	24	12
Feb.	5,802.6	187.0	294.6	4,640.7	680.3	.....	.....	.....	.....
Mar.	6,601.1	263.9	358.1	5,256.1	723.0	.....	.....	.....	.....
3 mo.	18,874.3	725.8	938.2	15,098.3	2,112.1	.....	.....	.....	.....

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap—Total	All Scrap—Purchased	By Types of Furnace: Cupola—Total	Cupola—Purchased	Air—Total	Air—Purchased	Electric—Total	Electric—Purchased
1950	61,497,000	29,403,000	9,474,000	4,666,000	1,118,000	407,000	6,385,000	3,628,000
1951	68,518,208	33,822,431	11,090,607	5,878,939	1,203,740	441,099	8,391,919	5,389,005
1952								
Jan.	5,847,011	2,788,426	846,891	449,935	101,211	38,150	743,233	470,126
Feb.	5,572,506	2,702,092	789,293	419,279	94,900	35,536	697,319	440,325
Mar.	5,902,529	2,860,364	791,165	415,853	92,751	35,013	741,793	475,161
Apr.	5,360,417	2,657,926	834,066	440,035	106,059	38,888	684,318	427,339
May	5,369,258	2,660,471	779,436	404,899	94,597	35,966	700,617	455,460
June	2,048,951	1,169,102	719,739	374,127	82,357	30,412	285,596	173,740
July	1,965,007	1,156,296	524,651	278,750	52,999	19,733	364,536	244,944
Aug.	5,470,696	2,738,593	721,255	348,181	74,351	28,091	682,405	446,543
Sept.	5,782,986	2,862,994	760,092	389,910	82,212	30,493	761,795	501,602
Oct.	6,256,031	3,066,041	851,458	439,401	98,947	37,743	814,565	546,189
Nov.	5,960,435	2,885,008	731,825	379,950	80,228	30,502	780,042	518,320
Dec.	6,089,722	2,973,633	804,275	412,177	92,621	35,064	758,845	491,084
Total	61,625,549	30,520,946	9,154,146	4,752,497	1,053,233	395,591	8,015,064	5,190,833
1953								
Jan.	6,256,718	3,061,551	810,254	413,971	95,430	35,695	795,292	517,963

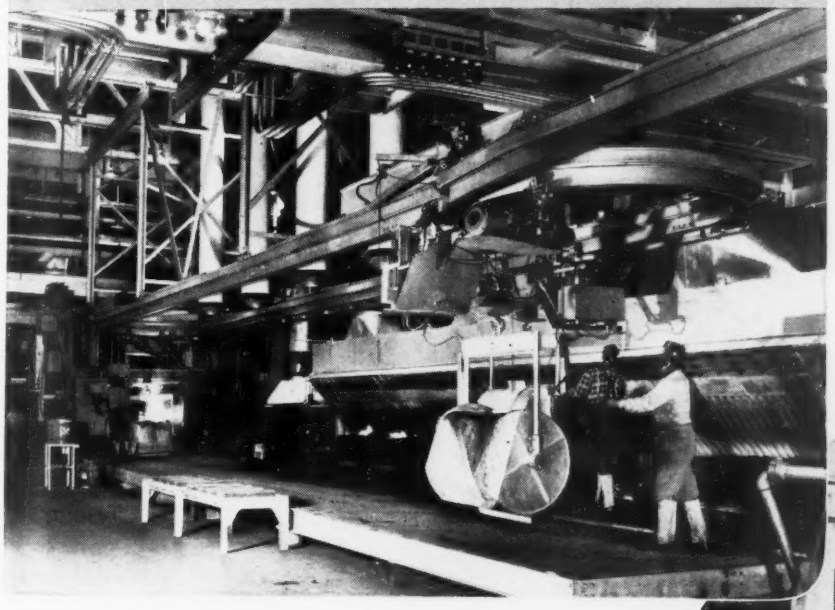
*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Based on new sampling method; not comparable to prior figures.



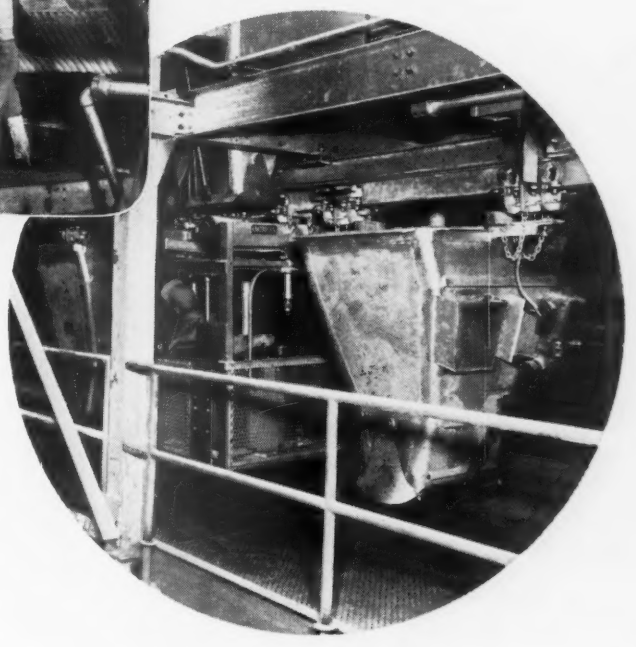
American MonoRail Cranes handle flasks through core setting to closing of cope and drag. 140 of these 1-ton cranes operate on 5800 feet of American MonoRail Girder Rail on the flask preparation line.

AMERICAN MONORAIL

Moves Core Sand, Flasks, Ladles in the NEW FORD FOUNDRY



At the pouring loops, ladles on American MonoRail carriers move at the same rate as the flasks for quick, easy pouring. 41 carriers operate on 1250 feet of Shielded Rail Master Track to complete this operation.



American MonoRail equipment in the new Ford Cleveland Foundry moves core sand from hoppers to core blowers by means of 3 cab operated carriers on a Shielded Rail Master MonoRail System which includes 950 feet of track and 10 motor operated 2-way glide switches.

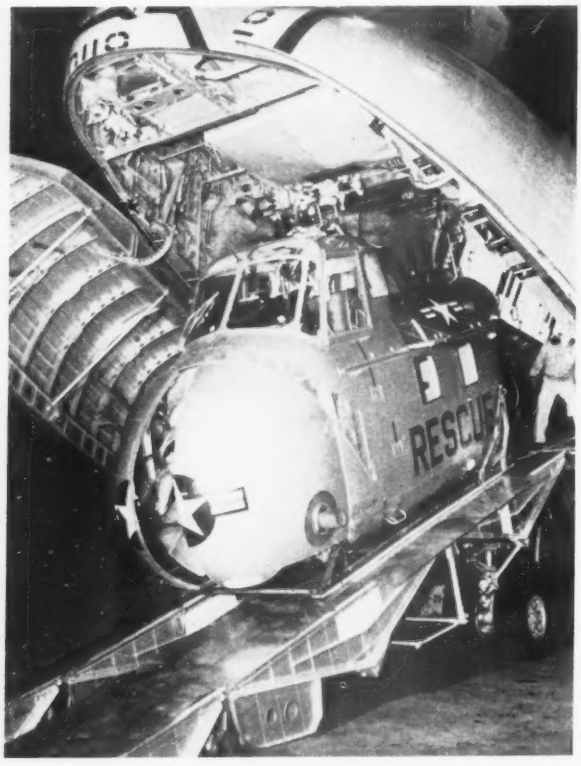
Other systems, as illustrated, handle flasks and ladles over extensive American MonoRail Installations.

Experienced engineers will be glad to consult with you on any handling problems in your foundry. Write for the new "Case Study File" showing other applications.

THE AMERICAN MONORAIL COMPANY

13122 ATHENS AVENUE CLEVELAND 7, OHIO

News Views



100 MAGNESIUM CASTINGS: Stripped for shipment, a Sikorsky S-55 helicopter is pulled into the cargo compartment of a C-124 Globemaster. Used by the military services for many assignments in the war area, the S-55 is fabricated largely from magnesium sheet and contains 100 magnesium castings

BABY CUPOLA: This miniature melting unit, used by Missouri School of Mines and Metallurgy for instructional purposes, was exhibited at the recent FEF conference in Cleveland. It will melt 36 lb of gray iron or 53 lb of brass per hour. An iron charge includes 5 lb of scrap metal, 1/32-lb of limestone and a coke ratio of 7 to 1

NO. 150,000: Clark Equipment Co., Battle Creek, Mich., recently produced its 150,000th fork-lift truck. It is shown being inspected here, left to right, by R. H. Davis, vice president in charge of production at Battle Creek; W. E. Schirmer, vice president in charge of industrial truck sales, and George Spatta, president. Clark produced the first industrial truck in 1919 and in the last 12 years manufactured 140,000 units, or 14 times as many as it had during the previous 20 years

25-YEAR MEN: Standard Brass Works, Milwaukee, recently honored its 25-year men with a party, as the firm has done for 29 years. Henry Kloepper, center, the newest of the oldtimers, was presented a wristwatch by Roy M. Jacobs, right, president. On left is Adolph Schott, the firm's first 25-year man, who retired in 1949, after 50 years with the company. (*Milwaukee Journal* photo)

BECAUSE OF B&P's EXCLUSIVE HORIZONTAL MULLING PRINCIPLE

The Speedmullor Gives More Than 3 Times the Mulling

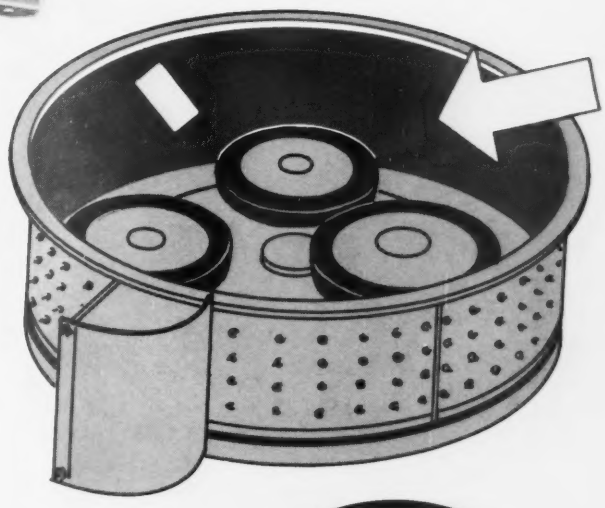
210,000 SQ. INCHES OF MULLING AREA COVERED EVERY MINUTE IN THE 80A

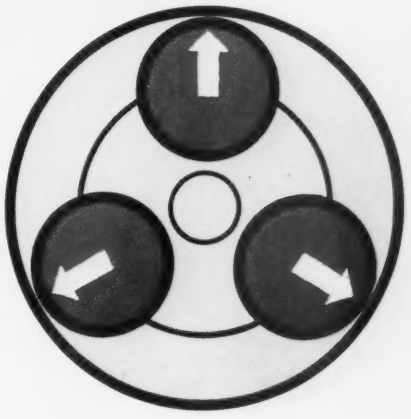
The mulling wheels of the new 80A Speedmullor cover 210,000 square inches of mulling area every minute . . . that's nearly three times the mulling area covered in the latest design conventional mixer.

Utilizing the modern principle of centrifugal force, the lightweight horizontal mulling wheels of the 80A apply a pressure of 32.7 p.s.i. to the sand as it is mulled in suspension between rubber-tired wheels and rubber-lined bowl.

In the latest conventional mixer, pressure is applied by massive spring-weighted, vertical wheels; the maximum pressure according to the manufacturer is 31.5 p.s.i. Thus, using the same basis of computation, the Speedmullor *provides approximately equal mulling pressure over nearly three times the mulling area every minute.* With the added advantages of non-slip, rubber-to-rubber mulling and a much faster sand discharge, more than three times the mulling results.

Every Speedmullor model offers the same comparable advantage.





Above: The three mulling wheels of the 80A Speedmullor rotating at 62 RPM cover an area of 210,000 square inches per minute.

Right: Using centrifugal force, each wheel exerts a pressure of 32.7 p.s.i. against the sand.

LOOK TO BEARDSLEY & PIPER FOR BETTER METHODS

WRITE TODAY FOR FULL DETAILS

SPEEDMULLOR

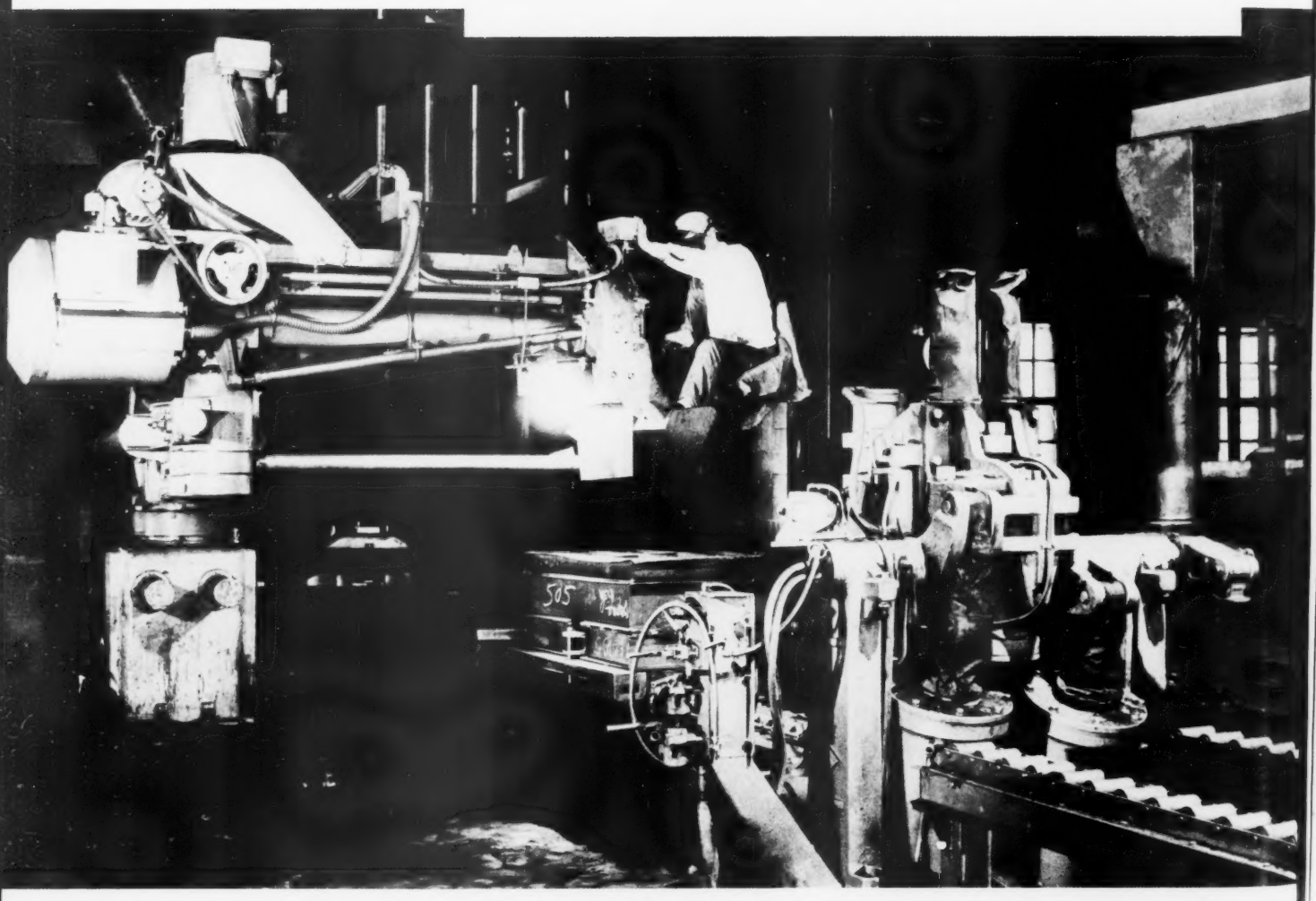
6 Models — Capacities from 7 to 76 Tons per Hour

DIV. PETTIBONE MULLIKEN CORP.
2424 North Cicero Avenue, Chicago 39, Illinois

2½ Times Capacity with Half the Men!

HOW Brooks Foundry Company INCREASED CAPACITY FROM 40 TO 100 TONS PER DAY WITH B & P SPEEDSLINGER, CHAMPION SPEED-DRAW, AND J & J ROLLOVER

The Brooks Foundry Company of Albion, Michigan, have mechanized their large-mold production with a Stationary Speedslinger, a B&P Champion Speed-Draw machine, and a J&J 1020 RX Rollover Draw machine. Copes are Speedslinger rammed on the Speed-Draw while drags are Speedslinger rammed on the rollover. Each mold contains from six to eight cores and casting weight varies from 800 to 5000 lbs. Before mechanization thirteen molders produced forty tons of castings per day. Now, seven men are able to produce over one hundred tons per day. This production boost is a tribute to the teamwork of these machines. Champion Speed-Draws and J&J RX Series Rollovers are *job-fitted* to slinger molding units.



Now, 7 men are able to produce 100 tons of castings per day on this Speedslinger molding unit at Brooks Foundry Company, Albion, Michigan. Before installation of the Speedslinger, the J&J 1020 RX Rollover and a Champion Speed-Draw, 13 men produced 40 tons.

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

FEMA

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DIV. PETTIBONE MULLIKEN CORP., 2424 North Cicero Avenue, Chicago 39, Illinois

NATIONAL CASTINGS COUNCIL ELECTS OFFICERS

HENRY J. TRENKAMP

DR. JAMES T. MacKENZIE

F. RAY FLEIG

FRANK G. STEINEBACH

ANNUAL meeting of the National Castings Council, held in Cleveland, Apr. 29, resulted in the election of the following officers: President, Henry J. Trenkamp, Ohio Foundry Co., Cleveland, and president of the Gray Iron Founders' Society; vice president, Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, and president, Foundry Educational Foundation; treasurer, F. Ray Fleig, Smith Facing & Supply Co., Cleveland, and representative of the Foundry Facing Manufacturers Association; secretary, Frank G. Steinebach, FOUNDRY.

The meeting was devoted to consideration of problems of the foundry industry in its relationship with the national defense agencies. The setup of the various phases of the industry in the NPA was discussed and the shortcomings considered. The council decided to make every effort to get the Ferrous Castings Section to be elevated to the status of the Ferrous Castings Branch of the Iron and Steel Division. Representatives of the industry indicated that such a step would avoid mistakes which were made during the Korean emergency and permit ferrous foundries to render greater service to the nation in time of emergency. Tribute was paid to the nonferrous foundry industry and its success in securing a Castings Branch of the Copper Division.

The problem of foundry safety was considered at length. William N. Davis, director, Safety & Hygiene & Air Pollution, AFS, reported on the work being undertaken.

Meetings of Interest to Foundrymen

June 8-9—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

June 15-19—Basic Materials Conference and Exposition, Grand Central Palace, New York

June 28-30—Alloy Casting Institute, annual meeting, Homestead, Hot Springs, Va.

June 29-July 3—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City

Sept. 16-18 — National Foundry Association, annual meeting, Plaza Hotel, New York

Sept. 17-18—Western New York Regional Foundry Conference, sponsored by Western New York Chapter of the AFS, Buffalo

Sept. 19-26 — International Committee of Foundry Technical Associations, annual foundry congress, Paris, France

Sept. 21-22—Steel Founders' Society, fall meeting, Homestead, Hot Springs, Va.

Sept. 21-25—Instrument Society of America, national congress and exhibit, Sherman Hotel, Chicago

Sept. 24-25 — Ohio Regional Foundry Conference, sponsored by University of Cincinnati and Ohio AFS Chapters, Cincinnati

Oct. 8-9—Gray Iron Founders' Society, annual meeting New Hotel Jefferson, St. Louis

Oct. 8-9—Michigan Regional Foundry Conference, Kellogg Center, Michigan State College, East Lansing, Mich.

Oct. 15-17—Foundry Equipment Manufacturers' Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 16-17—Northwest Regional Foundry Conference, sponsored by Oregon, Washington and British Columbia Chapters, AFS, New Washington Hotel, Seattle

Oct. 19-23—American Society for Metals, national metal congress and exposition, Public Auditorium, Cleveland

Oct. 29-30—Metal Castings Conference, sponsored by Purdue University, Michiana and Central Indiana AFS chapters, Purdue University, West Lafayette, Ind.

Nov. 4-6—Steel Founders' Society, T & O Conference, Carter Hotel, Cleveland

1954

May 10-14—American Foundrymen's Society, annual convention and exhibition, Public Auditorium, Cleveland

NON-FERROUS FOUNDERS SO

Holds Record Meeting

By FRANK G. STEINEBACH
Editor

A PRIDEFUL look at past accomplishments and a study of present and future problems featured the annual meeting of the Non-Ferrous Founders' Society held at the Bismarck Hotel, Chicago, May 3. The meeting marked the tenth anniversary of the founding of the society. L. H. Durdin, Dixie Bronze Co., Birmingham, and president of the society, presided.

James W. Wolfe, secretary-treasurer of the society, reported a membership of 400 and a sound financial condition. He spoke of the surveys which have been made on wages and fringe issues, and stated that another study is under way covering wages, bonuses, profit sharing plans and other features.

President Durdin indicated that the society should take a look at the present Washington picture and determine what should be done to further interests of the industry. He stressed the success of the Castings Branch of the Copper Division of NPA, and pointed to the part played by the society in making this excellent record possible. The president also outlined other activities of the society including the development of terms and conditions of sale, which have been approved by the National Association of Purchasing Agents; the selection of a new emblem for the society; the work in securing decontrol prices by the Office of Price Stabilization, the new news letter being prepared by Mr. Wolfe, and the collection of information needed by the industry. In connection with the latter, he urged all members to make a greater effort to supply the data requested by the society, since frequently this information is of great importance in furthering the best interest of the industry. Reference also was made to the article on "Progress in Brass and Bronze Castings" by Vaughan C. Reid and Paul G. Maganus and published in the May issue of FOUNDRY.

H. A. White, Smeeth-Harwood Co., Chicago, reported on the development of an insurance and welfare program by the society. A questionnaire sent to the membership produced a 55 per cent reply. Of the 226 replying, 140 had some type of plan, 86 reported no insurance set up. Four were under a state controlled plan. Division of costs shows no definite pattern regarding contributing and non-contributing plans. Because it is believed that the study will be of considerable help to the small foundry, it will be continued.

The society adopted amendments to the by-laws providing for the election of six directors at large in addition to the 21 district directors.

Walter M. Clark, D. W. Clark & Co., Boston, and recently connected with the Castings Branch, Copper

Left—The largest annual banquet in the history of the society was held at the Bismarck Hotel on May 4, with 250 persons attending

SOCIETY

ROBERT LANGSENKAMP
President

H. A. WHITE
First Vice-President

WILLIAM L. LEOPOLD
Second Vice-President

JAMES W. WOLFE
Secretary-Treasurer

Division, told the meeting that the society was of great assistance to the branch during the emergency since it supplied much needed information and the answers to many questions. The officers made many trips to Washington and provided advice in the matter of foundry problems. E. J. Metzger, Multi-Cast Corp., Wauseon, O., and formerly handling castings problems in the OPS also praised the assistance provided by the society.

Mr. Wolfe discussed the present trend of activity in Washington, with the NPA becoming a function of the Department of Commerce under the Office of Defense Mobilization. He warned that many problems lie ahead, and assistance of the society will continue to be required in Washington.

An interesting discussion on procedures in determining foundry costs was led by William A. Gluntz, Gluntz Brass and Aluminum Foundry Co., Cleveland, and chairman of the cost committee. Mr. Gluntz reported on the revision of the cost system developed by the society.

Problems which have faced nonferrous foundries in the Chicago area during recent months through the theft of large quantities of metal and the steps which have been taken by the industry to protect against the burglaries, were outlined by Grant V. W. Roth, president, Ace Foundry Co., Chicago. A committee has been formed, funds raised and rewards offered for "information leading to the arrest and conviction of any person or persons feloniously breaking, entering or burglarizing our foundries or stealing our products." An advertisement offering rewards to $2500 appeared in a Chicago paper for the day of the annual meeting.

In concluding the meeting, President Durdin recommended a close study of the plan for building a government owned-society operated research laboratory for the study of nonferrous castings. Such a project would provide the facilities for studying requirements of the armed services for nonferrous castings. The president pointed out that the competition is not among nonferrous foundries, but with other forms of fabrication which would replace nonferrous castings. Therefore it is important that every avenue for improving the quality of the product be studied.

President Durdin also recommended the industry undertake further exploration of co-operative buying.

The largest annual banquet in the history of the society was held at the Bismarck Hotel, May 4, with 250 present. Feature of the program was the presentation of a beautiful plaque to the following past presidents of the society: Chester K. Faunt, Christensen & Olsen Foundry Co., Chicago;

Past and present society officers include, left to right, rear, Chester K. Faunt, William L. Leopold, William A. Gluntz, Roy M. Jacobs, Robert Langsenkamp and H. A. White; front row, left to right, are Fred Haack Jr., Walter M. Clark, J. D. Zaiser and L. H. Durdin. Last man is speaker Tony Weitzel

Roy M. Jacobs, Standard Brass Works, Milwaukee; Edwin W. Horlebein, Gibson & Kirk Co., Baltimore; William A. Gluntz, Gluntz Brass & Aluminum Co., Cleveland; Fred Haack Jr., Capital Brass & Aluminum Foundry Co., Chicago; Walter M. Clark, D. W. Clark & Co., Boston; J. D. Zaiser, Ampco Metal Inc., Milwaukee; and L. H. Durdin, Dixie Bronze Co., Birmingham. Mr. Horlebein was unable to be present. A special greeting from Shin-ichi Kawata, secretary of a nonferrous society in Tokyo, was read.

New directors of the society, elected for a three-year term, are as follows: William Meakin, R. B. Carolin Foundry & Machine Co., Detroit; E. J. Metzger, Multi-Cast Corp., Wauseon, O.; M. E. Nevins, Wisconsin Centrifugal Foundry Co., Waukesha, Wis.; and Kenneth R. Proud, Anstice Co. Inc., Rochester, N. Y.

New officers are as follows: President, Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Indianapolis; first vice president, H. A. White, Smeeth-Harwood Co., Chicago; second vice president, William L. Leopold, Northern Bronze Corp., Philadelphia; secretary-treasurer, James W. Wolfe, Chicago; Assistant secretary-treasurer, Edith Alexander.

A plaque like the one shown here was presented to each past president

Gray Iron Founders Offer Redesign Contest Prizes

Cash awards amounting to $500 will be divided among the winners of the fourth annual redesign contest sponsored by the Gray Iron Founders' Society. The contest is open to any person in the metalworking industry. Awards are made for the best examples of redesigns of competitive products for production in gray iron.

Purpose of the competition is to encourage more extensive use of gray iron by giving recognition to designers and others who have substituted gray iron successfully for other materials. Awards will be made at the society's 25th anniversary meeting in St. Louis in October.

Plan Diversified Program For ASTM Meeting

American Society for Testing Materials has planned a strong, diversified program for its 56th annual meeting to be held at Atlantic City, N. J., June 29 to July 3. Among eight symposiums planned for the week are those on "Metallic Materials at Low Temperatures," "Fluorescent X-ray Spectrographic Analysis", "Radioactivity in ASTM Work", and "Porcelain Enamels and Ceramic Coatings as Engineering Materials".

In addition, many other papers on a wide range of subjects will be presented at numerous technical sessions. The 27th Edgar Marburg Lecture will be given on July 1 by F. D. Rossini, Carnegie Institute of Technology, Pittsburgh who will discuss "An Excursion in Petroleum Chemistry".

Jerome Strauss, Vanadium Corp. of America, New York, will present the second H. W. Gillett Memorial Lecture on June 30. His subject will be "Micrometallurgy".

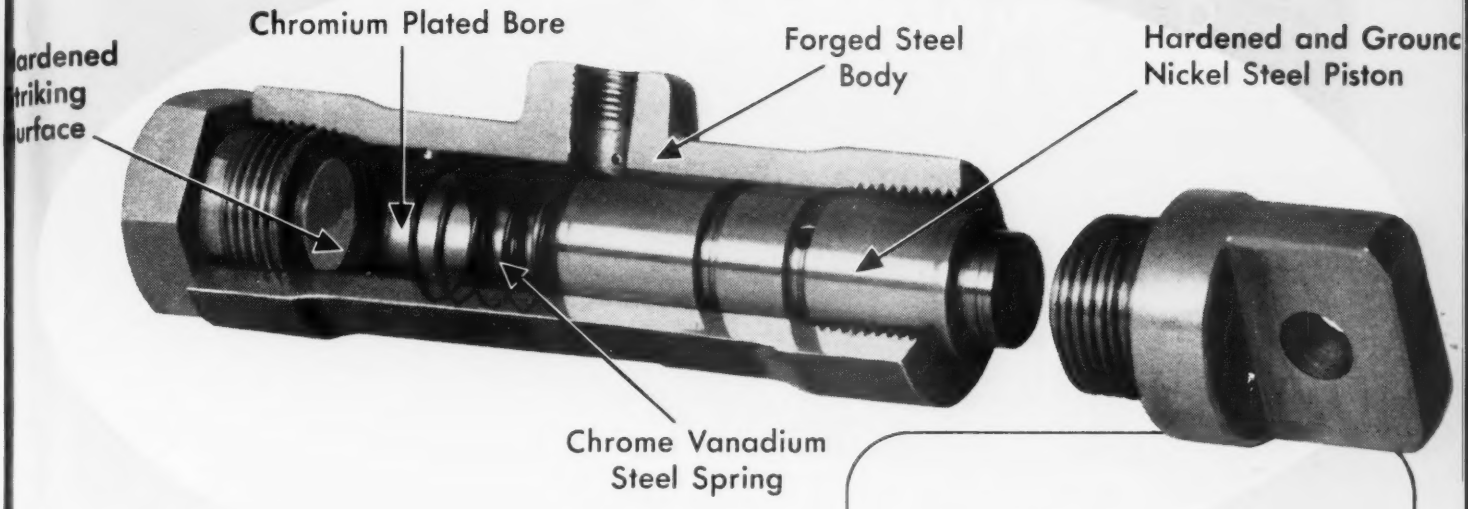
Conference and Exposition Cover Basic Materials

The first Basic Materials Conference and Exposition will be held at Grand Central Palace, New York, June 15-19. Originated by Clapp & Poliak Inc., New York, the event is being sponsored by a group of leading industrial corporations interested in industrial progress.

Discussions will cover materials used for all types of products and will consider such aspects as the effect of atomic products on materials of the future. Among topics to be considered in the sessions are low-alloy metals; light metals; titanium; plastics; ceramics; insulating, magnetic, lubricating and high and low temperature service materials.

Purpose of the convention is to bring to the attention of designers and production men the competition existing today among materials for all applications. Trends show newer metals replacing old, established metals. In addition, irons and steels are being improved to the point where they must be reconsidered in the light of their new properties and re-evaluated accordingly.

OSBORN FOUNDRY VIBRATORS



NEW STANDARDS FOR POWER, DEPENDABILITY, ECONOMY

- **Greater power in proportion to size.**
- **Long life with chrome plated bore and hardened pistons.**
- **Economical on air consumption.**
- **Greater dependability... more freedom from sticking.**

ABSOLUTE vibrator dependability is vital to continuous efficient mold production. To achieve this result, Osborn has developed this improved design to operate hour after hour, day after day under the severest foundry conditions. Built of the finest quality materials and precision workmanship, Osborn's vibrators provide a low cost insurance for maximum molding machine production. Available from Cleveland stock.

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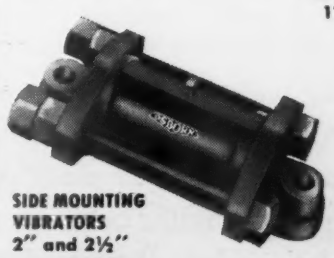
MATCH PLATE VIBRATORS
⅜", ¾" and 1"

SIDE MOUNTING VIBRATORS
1", 1¼" and 1⅜"



SIDE MOUNTING VIBRATORS
2" and 2½"

END MOUNTING VIBRATORS
1¼", 2" and 2½"

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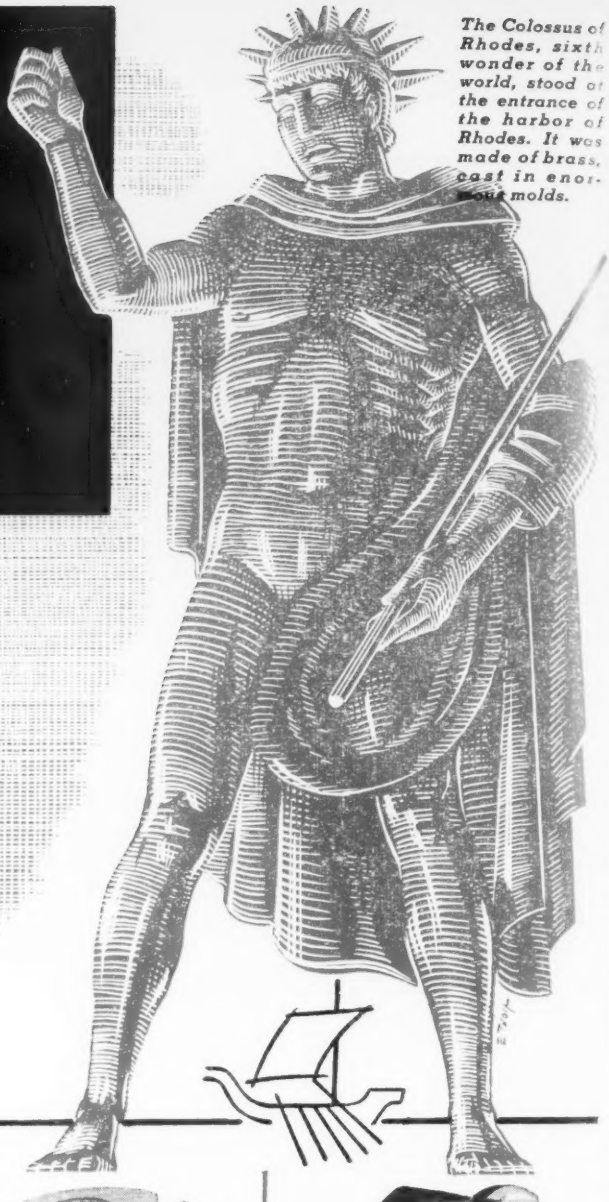
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

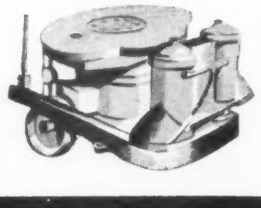
Triplact - a remarkable Additive to foundry sand

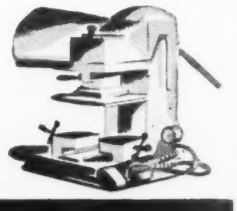


The Colossus of Rhodes, sixth wonder of the world, stood at the entrance of the harbor of Rhodes. It was made of brass, cast in enormous molds.

If not actually colossal, Triplact is at least an immense contributor to better results. Its triple action provides increased flowability, faster cleaning and fewer expansion defects.

As always, ECP offers you a product exhaustively tested and proven able to assure you of the results set forth herein. Triple-acting "Triplact" will help you produce better castings and more of them in less time and at a lower cost than ever before. Light weight and high efficiency make it truly economical. Ask for *all* the facts.





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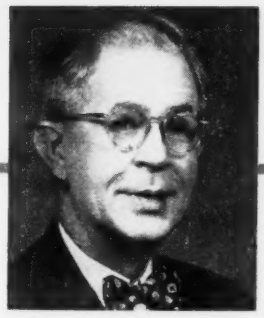

Man-to-Man

By RALPH L. LEE

Craftsmanship in Patternmaking

"Unless a man can find in his work not only a means of earning a living but a reason for living, he is hardly alive"

AS I GO around the country visiting pattern shops I often wonder whether the patternmakers I watch get the bang out of their work I get out of mine whittling away up there in the pattern department of the Lee Hobby Foundry.

I realize, of course, that if I did nothing *but* patternmaking from morning till night, day in and day out, it might be another story. There probably would be times when I'd feel like kicking myself in my own britches for ever taking up the trade. On the other hand, I don't imagine there is any trade or profession in which that question would not rise some time or another.

But be this as it may, I believe that patternmaking is in a class all by itself. There certainly can be little question that most of our former skilled crafts and trades have been broken up into pieces and each piece handed over to a specialist or operator who works in strict accordance with specific plans already made for him, following the rules and the prints as a mechanical piano follows the holes punched in the music roll. This may be stretching it a bit, but it does illustrate the trend of things.

On the other hand, patternmaking —with notable exceptions, of course— has managed to shy clear of this movement, it seems to me. And I think I know why: The blueprints this craftsman gets contain only a portion of the information he'll have to use to finish his job. Every job he gets is different—so different, in fact, that there isn't very much likelihood of standardization butting in to any extent.

As an amateur, I know I can't even begin to tackle a pattern job until I can close my eyes and see the pattern to be in almost complete detail; in other words, we've got to get the dope off the print and into our heads before we even start to begin. (At least we should).

In fact, we can't start to begin until, in our imaginations, we take our idea of the *pattern to be* down into the foundry and try to mold it. If there are cores (and some of them are certainly hum-dingers) we've got to picture the hole they're going to make, the core in reverse of the hole, the corebox in reverse of the core, the pattern for the corebox in reverse of the corebox, and driers in the reverse of the reverse of the reverse and all messed up with shrinks on shrinks up and down the line. All of these mental gymnastics are involved before you can really go to work.

Not only must we make an imaginary casting in an imaginary foundry, but we've got to take the *casting to be* down to the machine shop, set it up and machine it, so we can picture where the stopping points can or should be, how much to allow for machining, where the close points are or where to allow a little elbow room.

"The wife made it—I couldn't refuse it!"

And our reconnoitering isn't finished yet—we've got to find out how many of these unborn castings are going to be made, how many at a time, and at what rate—all of this and more before we can get down to the business of starting to begin.

Even with all of these imaginary trips taken and chores done, we have to picture the moves we are going to make in order to make the kind of pattern we've decided to make. What pattern materials would be best in this case, what equipment to use and what process, and we still don't start making the sawdust fly until we've made our master layout, some templates maybe, and checked and double checked them against dimensions on the drawing.

No sir, when you add up all of the dope you've got to use that doesn't show up on the print, you begin to get the heft of this grand old craft of patternmaking. I think we can safely say that there aren't very many crafts or professions left that require so much personal imagination, skill, ingenuity and judgment.

We have all heard it said that everything we use or wear started out in life as a casting or from a casting, but after this patternmaking review we'll have to admit that it isn't quite so; where everything really starts is in the imagination of the patternmaker.

The way I'm carrying on here you have a right to think I'm putting on a campaign to sell patternmaking as a career, and between us girls that's exactly what I'm up to. I'm trying to sell patternmakers on having more fun at their work and holding their heads a little higher as having one of the finest crafts a person can get into and one that plays a vitally important part in the whole economic scheme of things.

As a by-product of this selling job, maybe I can sell the nonpatternmakers on not taking the noble craft so much for granted. If I fail in these two objectives all is not lost, for I find that I have sold myself on liking patternmaking even more than I already did.

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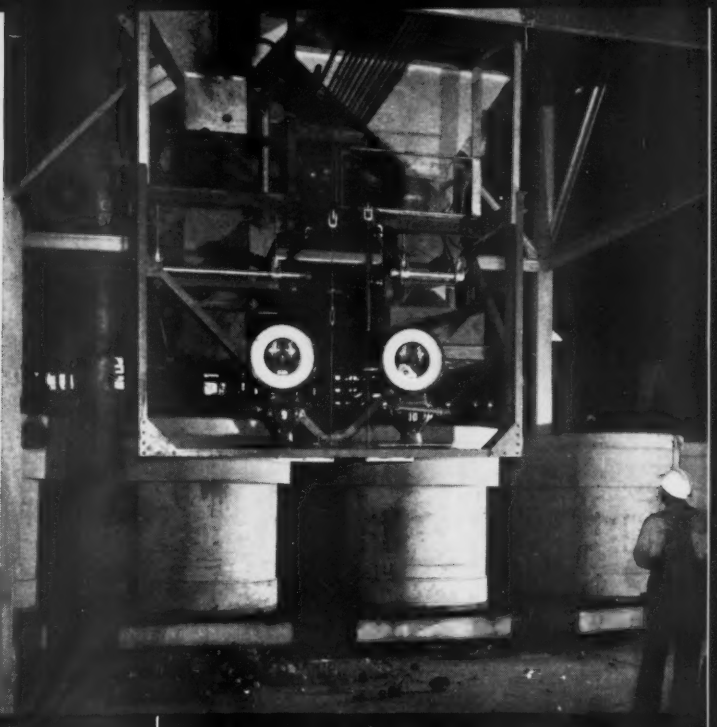
1 Link-shaped buckets on transfer car. (Note bucket in weighing position receiving metal charge.)



2 Charging bucket in position to receive coke and stone charges. (Note transfer car spaced to permit simultaneous loading of coke and stone.)

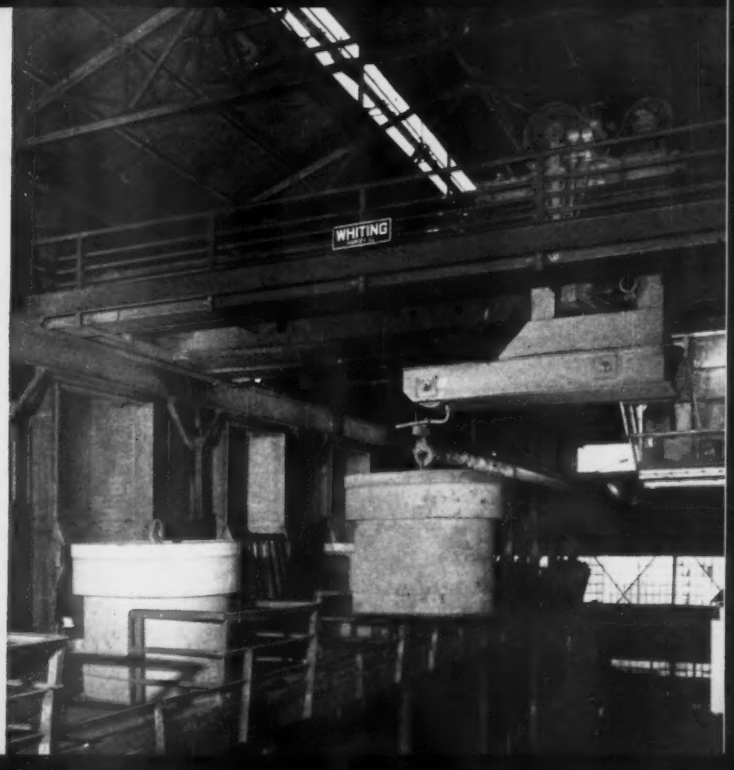
AMERICAN CAST IRON PIPE CO.

American Cast Iron Pipe Co., Birmingham, Alabama had an unusual problem. Their cupola stacks were link-shaped, (not round), yet they wanted the charging advantages of Whiting full cone-bottom buckets. Whiting engineers were called in to cooperate with Acipco Engineers and buckets of desired shape were designed and built to meet their requirements.

Just *another* example of Whiting engineering and Whiting's ability to cooperate with local engineers *on the job!*

3 Charging bucket now completely loaded and in pick-up position under charging crane. (Note uniform distribution of limestone in bucket.)

4 Whiting 10-ton underslung charging crane transporting bucket to charging position in cupola.



OBITUARY

CHARLES B. BOHN, 73, founder and chairman of the board, Bohn Aluminum & Brass Corp., Detroit, died Apr. 2, in Miami, Fla. At the age of 20, with three friends, Mr. Bohn purchased the Allyne Brass Foundry Co., Cleveland, accepting only enough brass business to finance their ventures in casting aluminum. In 1918, he started his own foundry in Detroit and in 1924 merged it with General Aluminum & Brass Mfg. Co. to form Bohn Aluminum & Brass Corp., there.

* * *

Hugh L. Kirsh Sr., 66, founder and president, Kirsh Foundry, Beaver Dam, Wis., died there recently. Mr. Kirsch went to Beaver Dam in 1913 as general manager of the former Western Malleable Iron Co., and established his own foundry in 1939.

* * *

Lawrence J. Holtzman, 44, president-general manager, the Multiplex Concrete Machinery Co., and Pacific Concrete Products Corp., Elmore, O., died Apr. 12, in Cleveland. Formerly vice president, Parsons Engineering Corp., Cleveland, Mr. Holtzman was also a director of Western Abrasive Metals Co., Chicago.

* * *

Emmett A. Williams, 62, vice president, National Bearing Division of American Brake Shoe Co., died in St. Louis, Apr. 14. Mr. Williams had been with National Bearing since 1913 and was made manager of its Meadville, Pa., plant in 1928 when it became a subsidiary of American Brake Shoe Co.

* * *

J. M. Fitzwilliam, 59, vice president, Foundry Equipment Co., Cleveland, died there May 7. Mr. Fitzwilliam joined the company 17 years ago.

* * *

Arthur G. Hopcraft, 67, since 1933 head of the purchasing departments, Cleveland Worm & Gear Co., and its subsidiary, the Farval Corp., Cleveland, died there Apr. 22. Mr. Hopcraft was associated with Ferro Machine & Foundry Co., Cleveland, from 1914-1927 and at one time was commissioner of purchases for the city of Cleveland.

* * *

Gustave H. Kann, president, Pittsburgh Crushed Steel Co. and subsidiaries, Pittsburgh, died Apr. 9. Mr. Kann was an alumnus of Carnegie Institute of Technology. He was a former director of the Foundry Equipment Manufacturers' Association and president of the Metal Abrasive Council.

* * *

Walter A. Lamp, 76, secretary-treasurer of the Lamp & Miller Mfg. Co., Milwaukee, died in that city, Apr. 27.

* * *

Lee R. Raymond, 66, retired founder and president, California Brass Mfg. Co., Los Angeles, died Apr. 4.

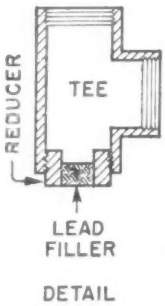
* * *

J. Beach Clow, 49, vice president, James B. Clow & Sons, Chicago, plumbing and water works supplies,

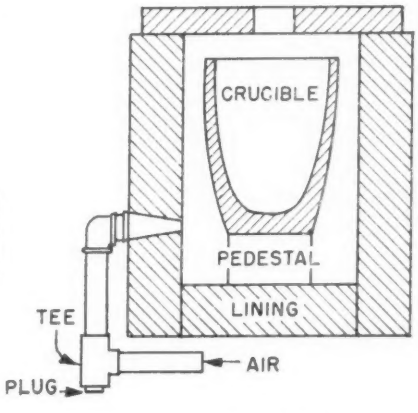
(*Concluded on page* 212)

How To Do It . . .

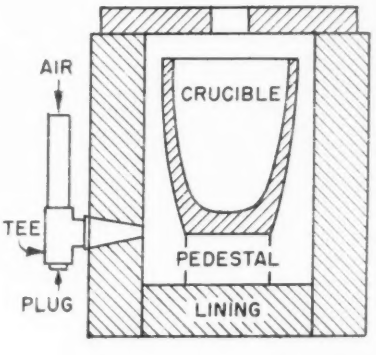
By JOHN J. MARKOWICH
Foundry Superintendent
Weiger Weed & Co.
Detroit



DETAIL OF TEE.



POSITION OF TEE WHEN AIR SUPPLY ENTERS FROM BOTTOM.



POSITION OF TEE WHEN AIR SUPPLY IS FROM TOP.

Eliminating Plugged Burners and Air Lines on Crucible Furnaces

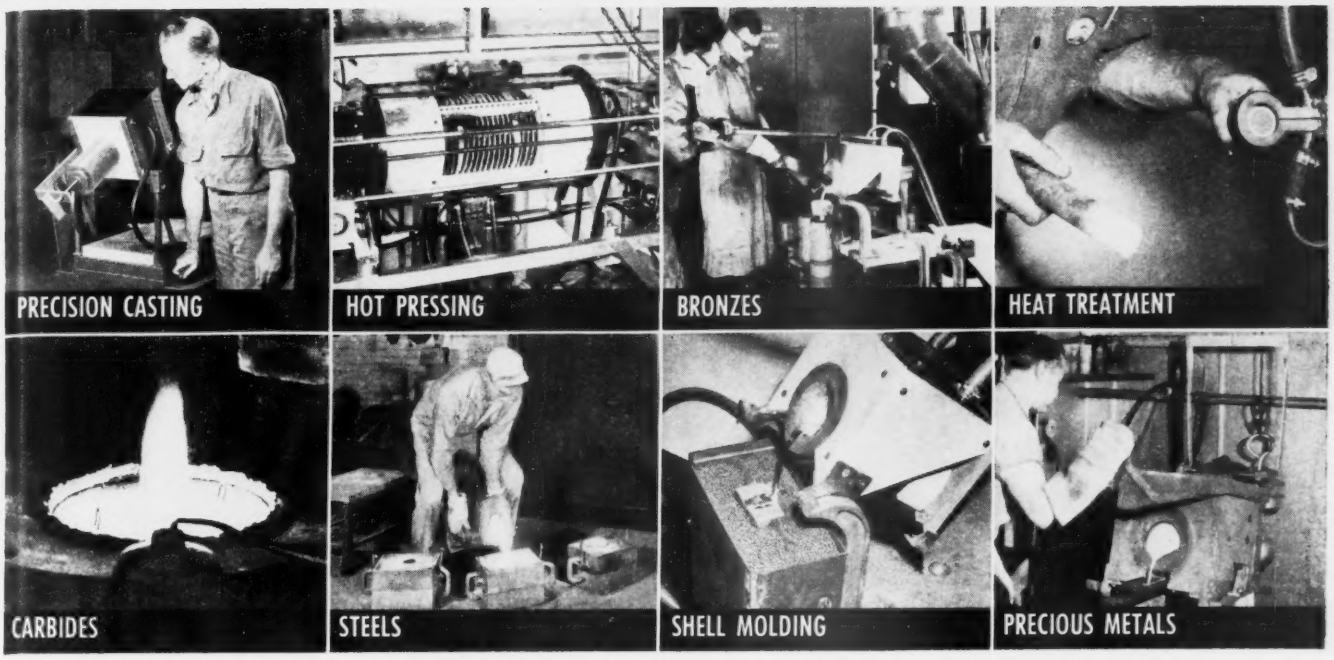
SOMETIMES an air line or burner on a crucible furnace may become clogged if a crucible of molten metal should break and the furnace drain hole is plugged or too small to allow the free metal to escape. To avoid the possibility of such plugging, a tee fitting may be used in place of an elbow in the air or fuel line leading to the furnace.

The open end of the tee is plugged with a stopper made from a reducer one size smaller than the pipe leading to the furnace. Molten lead or a lead alloy should be poured into the reducer while it is resting on a flat refractory brick. After the lead is solidified the plug is screwed into the the tee fitting.

In the event the crucible should break and the furnace drain hole is plugged or is too small to permit the spilled metal to escape, the molten metal, when it reaches the plug, will melt out the lead and run out of the furnace without filling the line and solidifying there.

When the furnace is repaired, the reducer plug can be removed simply by unscrewing it. The lead is replaced and you are ready to operate again.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $10 for each idea submitted and published. Send a photo or drawing with your idea



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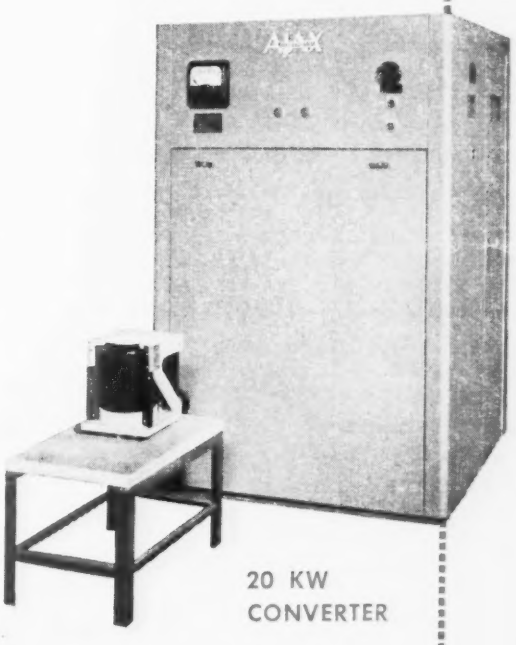

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153

7 low-cost ways to weld steel castings

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2. **P&H .25C (E7016)** — For castings repair where carbon is preferred to alloys for raising tensile strength. Lets you match both chemical analysis and heat-treating properties, a condition possible only with low-hydrogen coating.
3. **75LP (E8016)** — For 2% to 3% nickel steel castings. Charpy impact values of 20-35 ft. lbs. at −175° F.
4. **P&H .40C (E9015)** — For .40 carbon castings where you want to match both chemical and mechanical properties.
5. **AW2B (E9016)** — For repair welding of cast armor, "off analysis" and high-sulfur steels.
6. **P&H # 7 (E9016)** — Matches properties of Grade C and castings of similar analysis after heat treatment.
7. **90LH-2 (E10016)** — For high-tensile castings and alloy steels, such as SAE 8630, 4130, and comparable types, where the weld metal must match the heat-treating properties of the parent metal.

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2502

(*Concluded from page* 210)

died May 5. Mr. Clow, also vice president of Eddy Valve Co., Waterford, N. Y., and Iowa Valve Co., Oskaloosa, Iowa, Clow subsidiary companies, was graduated from Yale University and served 4 years with the Navy in World War II.

* * *

George Hehr, 75, for nearly 40 years a patternmaker, Standard Pattern Co., Cleveland, died there Apr. 27. Mr. Hehr retired approximately 6 years ago.

* * *

Lester W. Brann, 57, for 10 years treasurer, Belle City Malleable Iron Co., Racine, Wis., died recently. Mr. Brann retired last December.

* * *

Henry S. Peterson, 75, retired president, Peterson Core Oil & Mfg. Co., Chicago, foundry suppliers, died Apr. 22.

* * *

Parker H. Woods, 77, chairman of the board of directors, St. Louis Coke & Foundry Supply Co., St. Louis, died Apr. 18.

Quality Control Course Offered at Purdue

An advanced course in quality control by statistical methods will be offered at Purdue University, Lafayette, Ind., June 3-11. A new, simplified approach to the subject stresses practical applications of methods presented in lectures, demonstrations and laboratories.

The course is designed for those who have had the equivalent of one of the previously presented intensive courses on the subject. Topics include control charts, significance of differences, linear correlation, single sampling, sequential sampling for attributes and measurements, analysis of variance, multiple correlation, use of calculating machines and the Chi square technique for comparing observed frequency results with the theoretical.

Instructors are Cecil C. Craig, University of Michigan; Lloyd A. Knowler, University of Iowa; Edwin G. Olds, Carnegie Institute of Technology, and Mason E. Wescott, Northwestern University.

Cost of the course is $100 and enrollment is limited to fifty. Application may be made to Quality Control Short Course, comptroller's office, TED, Purdue. Room reservations should be made directly with the Union Club, Purdue Memorial Union Building, or Fowler Hotel, Lafayette.

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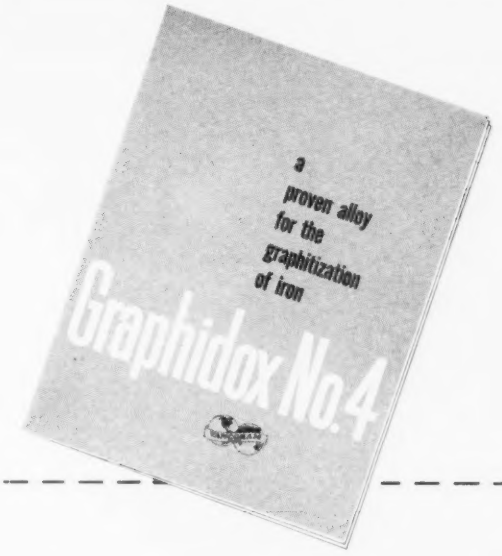

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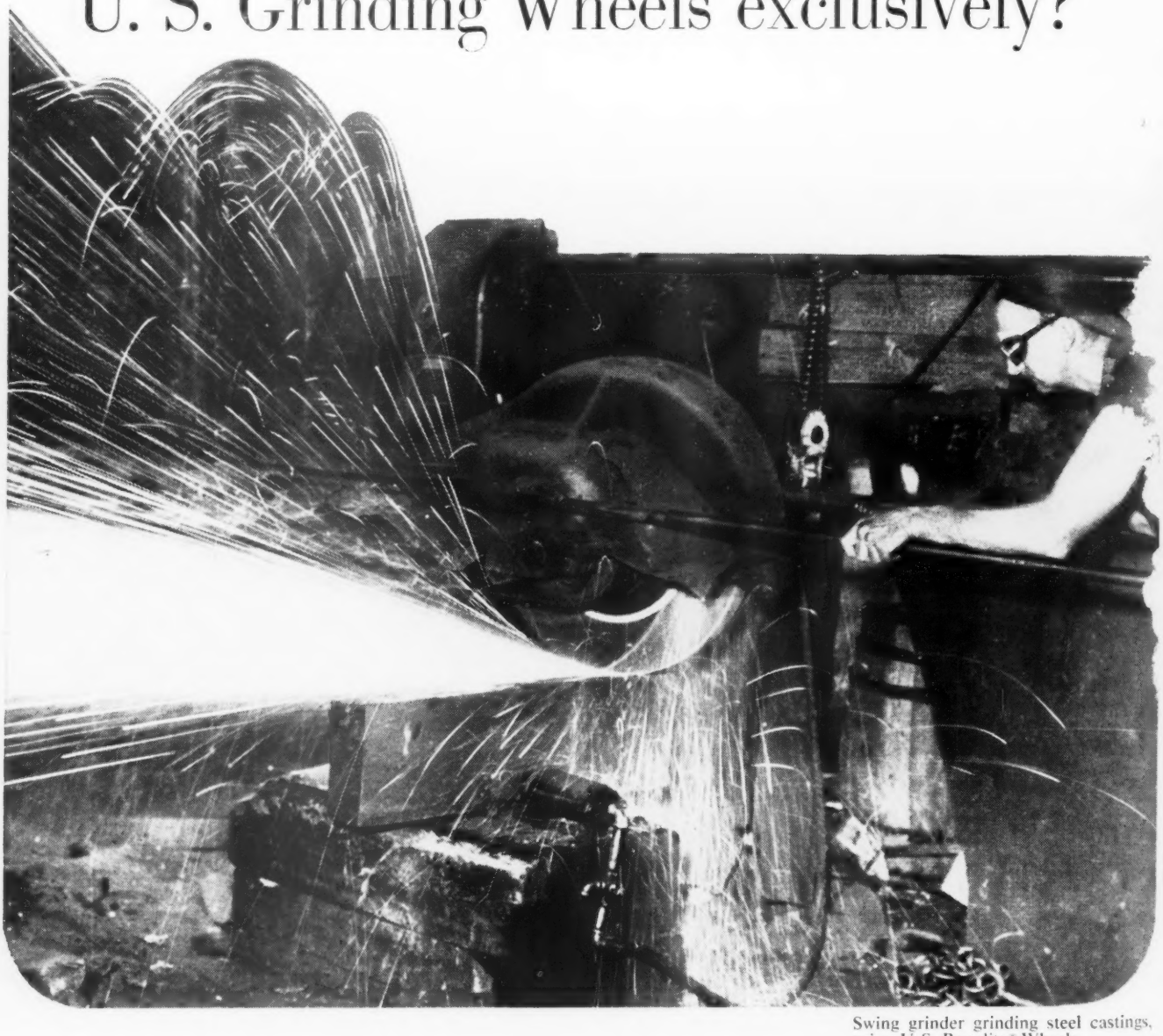

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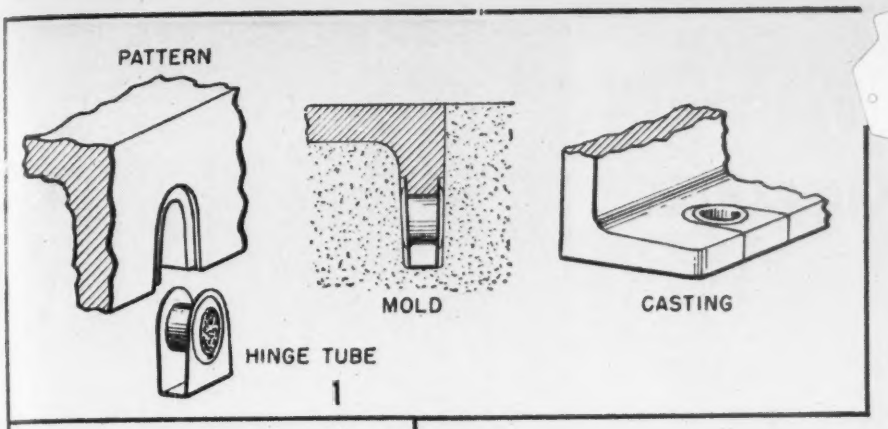
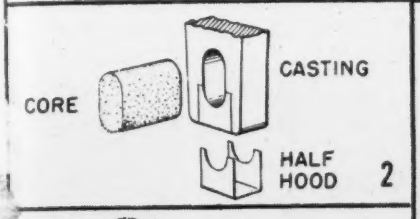
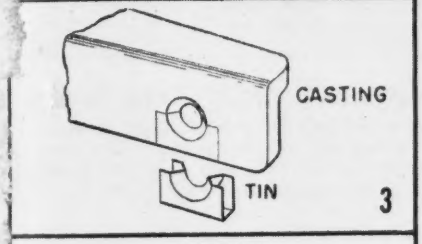
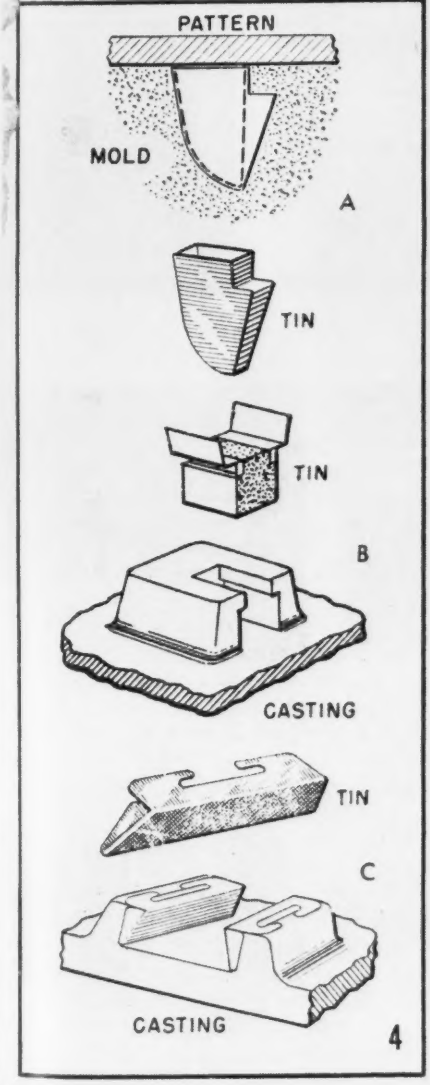


ABC of Foundry Practice







How To Eliminate Some

MACHINING on CASTINGS

By H. L. SMITH
Smith & Richardson Mfg. Co.
Geneva, Ill.

DUE to increased costs of labor and materials, as much time as possible should be saved in the machining of castings to keep down the cost of finished castings.

Outlined here are several methods of eliminating certain drilling and tapping operations, together with a method for casting difficult lugs or projections without machining. Foundries and pattern shops have known of some of these devices for years, and frequently it will be helpful for the patternmaker to recommend to the casting designer that the pattern equipment provide for taking advantage of the cost savings incident to reduced machining.

For many years foundries, particularly stove foundries, have been using tinned sheet metal forms known as hinge tubes for coring holes in stove doors and door frames to accommodate hinge pins. Any hole on a relatively thin lug or rib which extends into the mold perpendicular to the parting line of the mold, can be cored with a hinge tube, thereby saving drilling time and the cost of expensive jigs and fixtures. Many times a hole can be cored where it is impossible to provide a hole by drilling. The cored holes are true to size, smooth, and accurately located.

Fig. 1 shows a typical hinge tube for forming a round hole, together with a pattern section, mold, and finished casting. The pattern is provided with a notch to locate the tube in the required position. The notch is of such shape that the tube fits freely, so that when the sand is rammed around the pattern, and the pattern drawn from the mold, the tube will be left undisturbed in the mold. When the mold is poured the tube becomes part of the casting, and when the casting is removed from the mold, the core sand in the tube shakes out readily. The sheet metal tube, being protected by a core sand mixture on the inside, does not melt, but welds to the casting, forming a permanent union.

Hinge tubes for forming round holes generally are made in a great number of sizes; a limited number of oval sizes also are available.

Fig. 2 shows a half hood which often is used when the correct size or shape hinge tube is unavailable, and when the quantity to be used will not warrant the die expense necessary to produce a special hinge tube. The pattern is slotted to locate the hood in much the same way as when a hinge tube is used. The sand core is placed in the pattern with both ends extending slightly beyond the sides of the pattern, and covered with the half hood. The mold then is rammed up in the usual manner, but a little tucking will be necessary under the protruding ends of the core.

The mold is rolled over and the pattern drawn in the usual manner. The core is left anchored in the

(*Continued on page* 217)

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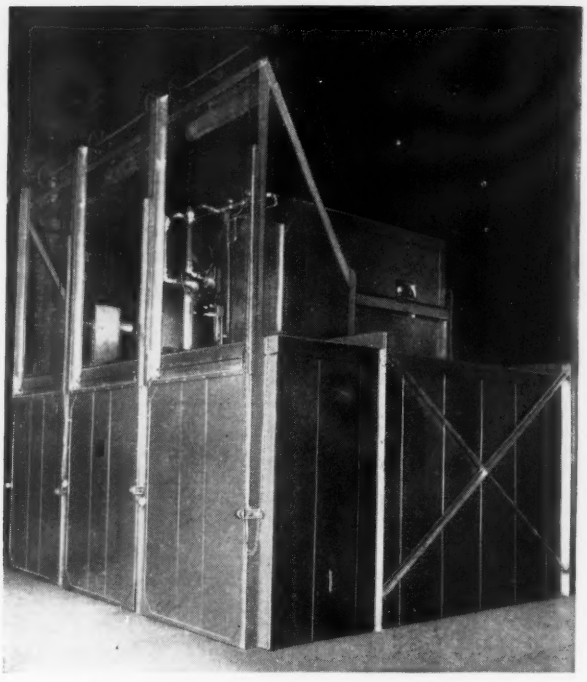

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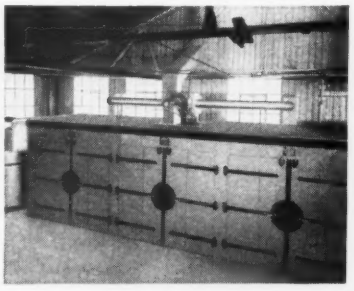
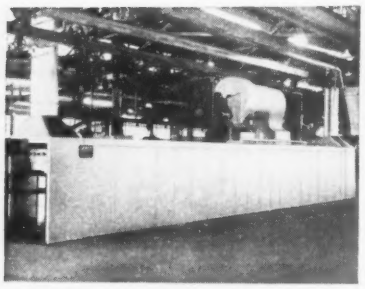
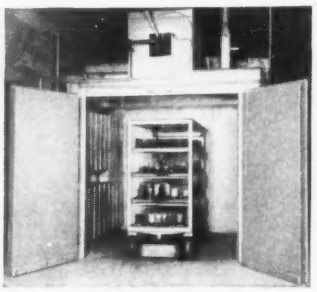


Three Compartment Rack Type Oven

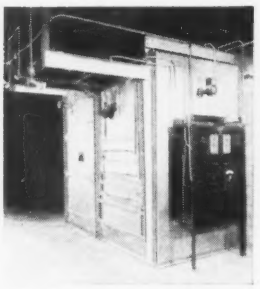
Lanly Car Type Oven



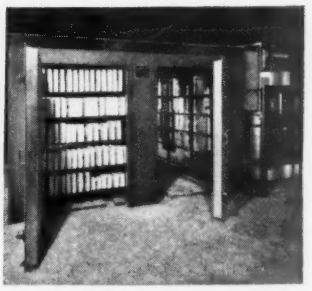
Continuous Core Blacking Oven



De-waxing Oven



Combination Rack and Drawer Type Oven



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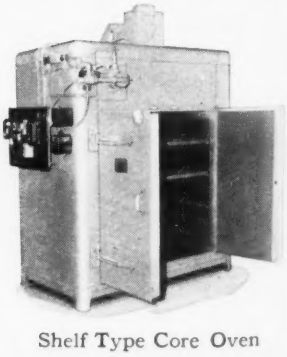
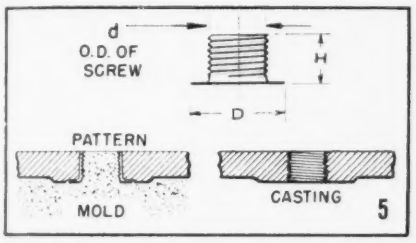


Shelf Type Core Oven

(*Continued from page* 215)

mold with the half hood below it, its purpose of keeping sand out of the pattern opening being accomplished. Any shape core can be used with a half hood, but since hoods are made up specially, the number of castings required would determine whether or not their use would be practical.

Another type tin form which is similar to the half hood and hinge tube is the countersunk hole tin as shown in Fig. 3. As the name implies, this tin forms a countersunk hole in a relatively thin casting. Its use is the same as a hinge tube or half hood, but in this case the pattern forms half of the countersunk hole, and the tin the other half. It is necessary for the molder to pinch a small amount of sand into



the countersunk hole when ramming the pattern. As the pattern is drawn, a small bridge of sand forms the countersunk hole with the tin again keeping the sand out of the pattern opening.

Other tin forms are used for the quantity production of castings with lugs, bosses, feet, or other projections which would interfere with drawing the pattern, thereby eliminating the use of sometimes complicated cores or draw backs. The general principle of all tin forms is the same. The desired shape is formed from light gage tin plate, and made in such a manner that it can be held firmly in place on the pattern equipment while the sand is being rammed, and will be left undisturbed in the mold after the pattern is drawn. A few examples of tin forms are shown in Fig. 4.

Fig. 4-A illustrates a standard tin form used to form a door catch on the frame of a furnace or stove. Fig. 4-B illustrates a form used to make a slot for a bolt head. Fig. 4-C illustrates a special form used to make a dovetailed groove. These are just a few of the many tin forms which can be manufactured, and which can save considerable time in the machining of castings.

Threaded inserts and screw shells are used for casting a threaded hole. Screw shells are made of drawn tin

(*Concluded on page* 220)

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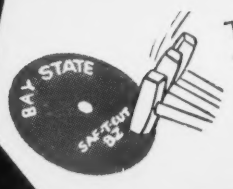

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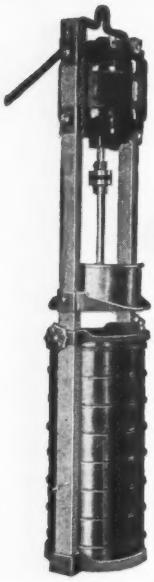

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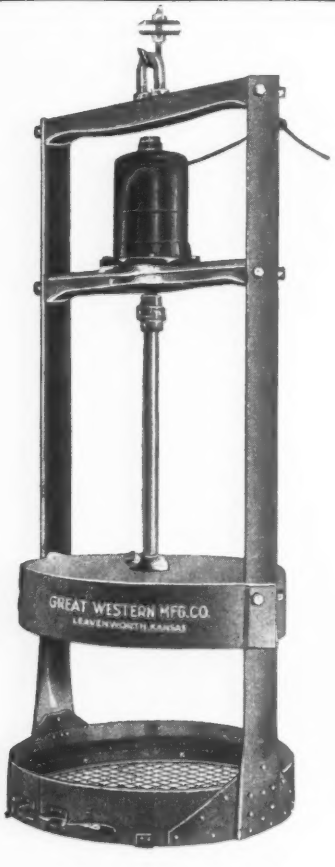

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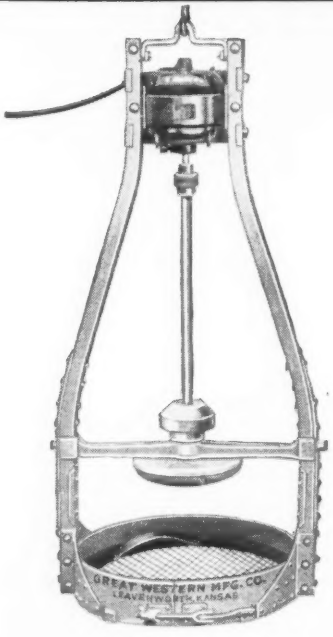

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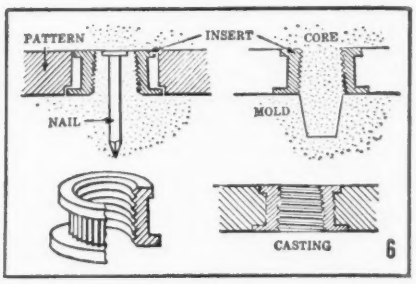
plate with a rolled thread. While the rolled thread is not perfect, it is satisfactory for grease fittings, oil cups, and similar applications. However, because of the nature of a rolled thread, a presure-tight connection is not possible. Screw shells eliminate the cost of drilling and tapping, and are used successfully in both regular and hard iron castings. They are indispensable where drilling and



tapping a hole is difficult or impossible.

Fig. 5 illustrates the use of a screw shell. The pattern is provided with a hole large enough to allow the shell to draw freely. The shell is dropped into the pattern, sand rammed in the usual manner, and the pattern drawn leaving the shell in the mold.

In cases where a more accurate thread is required, a threaded insert can be used as shown in Fig. 6. Threaded inserts are machined from bar stock, and therefore can be furnished in a variety of diameters, lengths, and screw sizes. Threaded inserts are sometimes used in chilled or white iron castings where drilling and tapping is impossible because of the hardness of the metal.

In conclusion it might be stated that a patternmaker or foundryman can simplify a difficult core assembly by using a tin form, or, when a series of holes are required in the casting, a hinge tube can be used to advantage.

Book Review

Mechanical Inspection, by W. H. Armstrong, cloth, 361 pages 6 x 9 in., published by McGraw-Hill Book Co., New York. Price, $5.50.

Purpose of this work is to aid in the training of inexperienced men and women as inspectors in machine shops or related industries. Presented simply, as a practical manual, it is meant primarily for use in class work at technical institutes, vocational industrial schools or industrial training classes. It also contains sufficient detail to permit its use in self-instruction.

New Coreroom

(*Concluded from page* 119)

percentage of the cores used at Midwest, which is predominately a squeezer shop, are thoroughly baked in this length of time. A few of the larger cores are left in the oven for a second cycle if they are not completely baked the first time around. The oven is loaded from the north side. Cores come directly off the conveyor and are unloaded from the opposite side of the oven. They then go to the assembly benches for trimming, pasting and assembly. After leaving the assembly benches certain cores are dipped to prevent penetration and assure smooth surfaces. These cores are then dried in a drawer type oven located in the southeast corner of the coreroom.

Delivery of cores to the molders at present is accomplished by means of pneumatic-tired buggies. However, a monorail system has been installed and within a short time all cores will be delivered via the monorail, which connects with the same system used for delivery of iron to the molders. This method is expected to minimize core breakage.

Bake Cores Rapidly

When requirements for additional corebaking facilities develop, which can be expected if the present trend continues, plans are being considered to install a dielectric baking oven. Cores most adaptable to this process can be thoroughly baked in 2½ to 3½ minutes. This will necessitate using a resin binder, instead of oil, and plastic driers. Core plates for this type baking can be made of plastic, transite or even plywood if it is properly treated. The number of driers or core plates required for a specific job can be greatly reduced due to the short baking cycle involved. Also they can be handled immediately after leaving the oven, as the material is a low conductor of heat. This eliminates the cooling period normally required for metal equipment.

Every emphasis is being placed on the operation of the coreroom at Midwest in an effort to reduce costs, increase production and improve the quality of the cores being produced with the hope that from a competitive standpoint the coreroom will be an asset rather than a liability.

Equipment Suppliers

Manufacturers of major equipment installed in the Midwest Foundry Co.'s new coreroom include: Avon Mfg. Co., Sidney, O., core drawers; Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, core blowers; Clearfield Machine Co., Clearfield, Pa., sand mixers; Foundry Equipment Co., Cleveland, core ovens; Mathews Conveyer Co., Ellwood City, Pa., conveyors; Redford Iron & Equipment Co., Detroit, core blowers.

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Activities of Foundry Groups

Pine State

SPRING meeting of the Pine State Foundrymen's Association was held at the Columbia Hotel, Portland Me., with 59 members present. Officers elected for the coming year include: Clyde Lake, Hyde Windlass Co., president; William Kemp, Portland Co., vice president; Harlan Penney, J. W. Penney, & Sons Co., treasurer; Otis Haskell Jr., Androscoggin Foundry Co., secretary.

Newly elected directors are: James Hamblin, Saco-Lowell Shops; William Naughton, Whitehead Bros. Co. Robert A. Colton, metallurgist, Federated Metals Division of American Smelting & Refining Co., was the speaker, discussing various practices and problems of the nonferrous industry. He invited discussion as he progressed in his talk and those present joined with enthusiasm.—*O. C. Haskell Jr., Androscoggin Foundry Co.*

Twin City

ELECTION of officers was held at the Apr. 14 meeting of Twin City Chapter of the AFS. O. J. Myers, technical director, Foundry Products Division of Archer-Daniels-Midland Co., is the newly elected chairman, succeeding J. W. Costello, American Hoist & Derrick Co.

Arthur Johnson, Northern Malleable Iron Co., St. Paul, was elected vice chairman. Lillian K. Polzin, Minneapolis Chamber of Commerce, was re-elected secretary-treasurer. Directors elected for a three-year term are: Harry Blumenthal, John Roth and Mike Flotten.

The meeting's speaker, Jack Caine, foundry consultant, refuted many of the common beliefs about the importance sand plays in quality castings in his talk "What Do We Know about Sand?" Mr. Caine believes that using the data obtained through sand control testing for evaluating sands is a serious mistake. He pointed out that sand control tests should be applied to hold variables within limits only after the foundry knows: What happens when the sand mixture is in contact with the molten metal?; Why does the sand mixture act in this way?

Mr. Caine contends that sand is rarely the cause of defective castings. Of much greater importance are such variables as sand-metal ratio, type of metal, mold or core surface, configuration, superheat, time, metalflow, pressure and size of voids in mold or core. Too often the sand is blamed for failures without considering these more important factors.

The effect of these variables in a particular mix must be studied and evaluated by means of test castings wherein the variables are adjusted one by one. Finally, a sand mixture can be selected on the basis of this data and methodical control testing instituted to regulate its composition exactly.

Mr. Caine was emphatic in denying the idea of a sand-metal reaction. Except in the case of some high-manganese steel alloys, the only difference between various metals reaction to sand is their rate of heat transfer.

The speaker had built his talk about a series of charts listing the principal variables such as penetration, scabbing and erosion. In no case was sand listed high among the variables to be investigated to control these defects.—*R. J. Mulligan, Archer-Daniels-Midland Co.*

PINE STATE FOUNDRYMEN'S ASSOCIATION met Apr. 9 in Portland, Me., to hear Robert Colton, Federated Metals Division, American Smelting & Refining Co. Mr. Colton is at right in the top view. Center view shows the present executive committee of the association. At the bottom is a group from the Saco-Lowell Shops, Biddeford, Me. Photos are by C. A. Wyatt, Debevoise-Anderson Co.

Central Indiana

MEMBERS totaling more than 100 and representing 21 different organizations were present at the April meeting of Central Indiana Chapter of the AFS. All enjoyed a discussion of foundry refractories which was presented by Ray

(*Continued on page* 224)

Pohlman Studios photo—courtesy of Trains and Travel Magazine

milwaukee

FOUNDRY MARKET AREA NUMBER SIX

With 143 foundries, approximately 20,000 employees and an annual production of three quarters of a million tons of castings, Milwaukee ranks as one of the nation's most important foundry centers. It is distinguished by many large foundries, employing upwards of 100 workers, which concentrate on producing castings for the farm equipment industry. And, as in other important foundry areas, many of Milwaukee's 64 gray iron foundries prefer ANNEALSHOT and/or SUPER-ANNEALSHOT because of their unusual effectiveness in keeping cleaning costs to an absolute minimum. Your Metal Blast representative will gladly tell you more about these excellent abrasives or, if you wish, write direct to **Metal Blast, Inc.,** 872 East 67th Street, Cleveland 3, Ohio.

Statistics from Penton's HOW TO SELL THE FOUNDRY MARKET

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METROPOLITAN Chapter of the AFS announced the winners of its apprentice contests at the Apr. 6 meeting. Left to right are Harold Berggren, Cooper Alloy Foundry Co., who won first prize in wood patternmaking; C. D. Preusch, chairman of the apprentice contest committee; and Linsy B. Mixon, New York Naval Shipyard, winner of first prize in nonferrous molding. Winners not present included Irwin Yablans and Russell Brown, both of New York Naval Shipyard, and Daniel Covine, Bornett Foundry & Machine Co. They won first prizes in steel, aluminum and cast iron, respectively. Left to right in the right photo are Chapter Chairman Warren Holm, Bernard Ames, Speaker Clyde B. Jenni and J. S. Vanick. Photos by John Bing, Metropolitan Refractories Corp.

(*Continued from page* 222)

Witschey, A. P. Green Fire Brick Co., Chicago.

Mr. Witschey stated that the type of refractory used is determined by the environment in which it acts. He divided his discussion into three groups—acid, basic and neutral—and described in detail the properties attributed to each. He emphasized the importance of using ASTM specifications in buying refractories. Demands of industry for better refractories and the increasing temperatures to which refractories are exposed have brought new processes and ideas from the research laboratories. Use of mortars and castables has made great strides, and gun type applicators for spraying castables are now being used successfully.

Among the slides used to illustrate the talk, Mr. Witschey showed the step-by-step construction of a flat-roofed annealing furnace made entirely of castable refractory. The job was completed in a much shorter time and at less material cost than with standard brick construction.

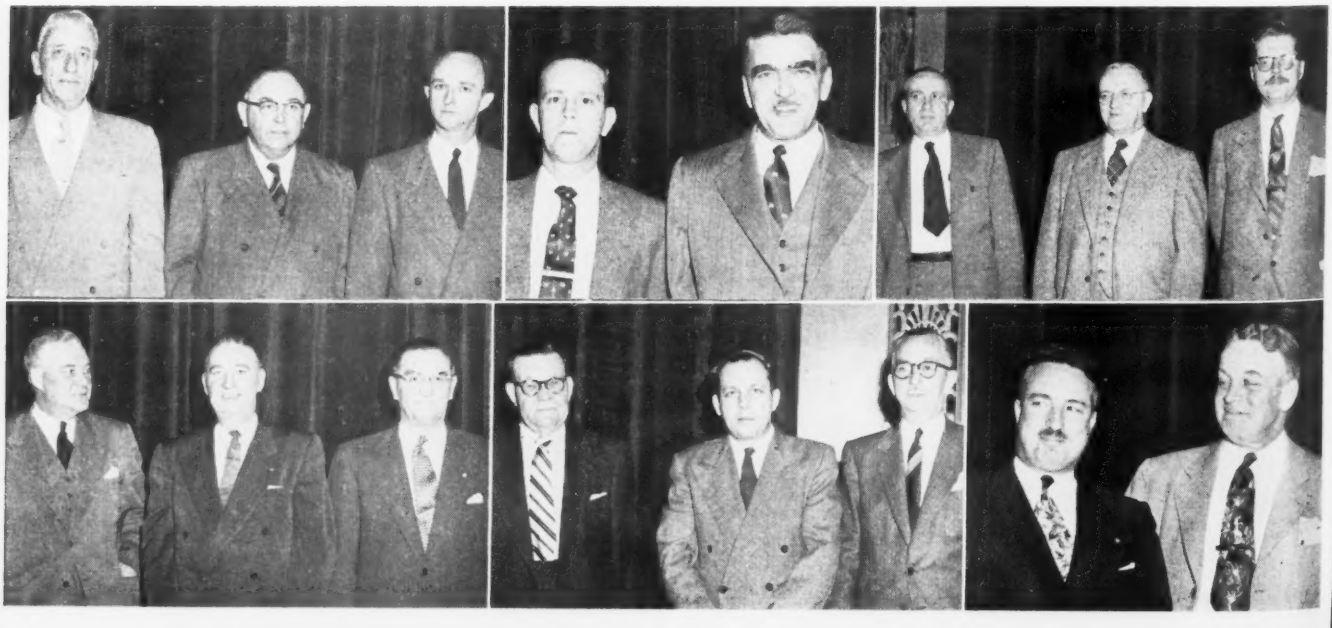
Special guests present at the meeting were I. R. Wagner, Electric Steel Casting Co., and president of AFS, and W. J. Klayer, Aluminum Industries Inc., Cincinnati, a national AFS director and the chapter's advisor—*William H. Faust, Electric Steel Casting Co.*

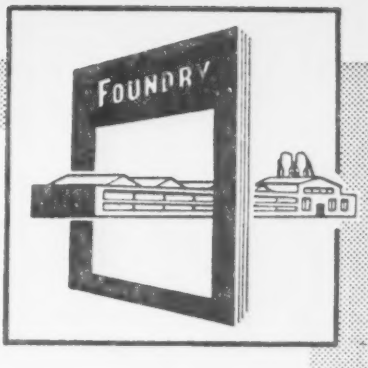
Wisconsin

OFFICERS to serve during the coming year were elected at the Apr. 10 meeting of Wisconsin Chapter of the AFS. Newly elected president is A. F. Pfeiffer, Allis-Chalmers Co.; vice president, Robert V. Osborne, Lakeside Malleable Castings Co., Racine, Wis. Secretary, P. C. Fuerst, Falk Corp., and treasurer,

(*Continued on page* 227)

WISCONSIN Chapter of the AFS dedicated its March meeting to management. Guests included, left to right, left view, C. P. Fuerst, Falk Corp.; J. A. Gitzen, Delta Oil Products Co., and C. M. Lewis, Badger Malleable & Mfg. Co. In second row are A. J. Dempsey, Crucible Steel Casting Co.; E. C. Wussow, Kaukana Machine Corp.; R. M. Stair, General Malleable Foundry Co.; F. D. Otto, Cutler-Hammer Inc.; F. A. Pampel, Chain Belt Co.; H. P. Wangelin, Rundle Mfg. Co.; R. L. Lee, Grede Foundries Inc., and R. V. Osborn, Lakeside Malleable Casting Co. Third row shows AFS Director M. A. Fladoes, Sivyer Steel Casting Co.; G. E. Tisdale, Zenith Foundry Co.; Everett N. Carpenter, Carpenter Bros.; P. J. Anderson, International Harvester Co.; F. R. Mueller, Modern Equipment Co.; E. J. Wabiszewski, Maynard Electric Steel Casting Co.; R. L. Moberly, International Management Institute, University of Wisconsin, guest speaker; and Chapter President J. A. Risney, Risney Foundry Supply Co. Photos by Walter V. Napp, Delta Oil Products Co.





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Write the name of the advertiser and the page number of the ad in the spaces provided. Check the type of information you want. After you have finished going through this issue of FOUNDRY and have jotted down all of the ads on which you'd like more information, just tear out the card, drop it in the mail. We'll do the rest.

Our staff will forward this information to the advertiser immediately so you'll be relieved of the necessity of writing several letters. You'll hear from the advertiser directly, answering your request.

FOUNDRY
Readers Service

FIRST CLASS
PERMIT No. 36
(Sec. 34.9 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio
Readers Service Dept.

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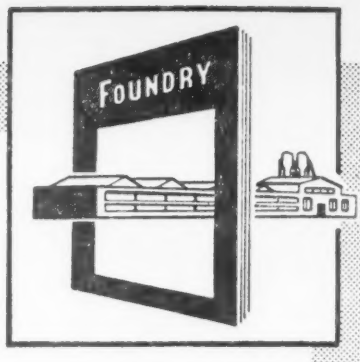
6-53



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Our staff will forward this information to the advertiser immediately so you'll be relieved of the necessity of writing several letters. You'll hear from the advertiser directly, answering your request.

FOUNDRY
Readers Service

No Matter What Your SAND Requirements...

Look to WEDRON

- Rounded Grain Sand
- Uniform Screen Sizes
- Ground Sand
- Shell-Molding Sand
- Special Grades For Every Purpose

THERE'S no guesswork with WEDRON sands for foundry use. You can order what you require and be sure that you're getting *exactly* the grade you specify. Each and every shipment is uniformly graded to exacting standards at the WEDRON plants.

Whether you do shell-mold casting, lost wax casting, or any other special type of foundry work, you can get the sand you need from WEDRON. The finest silica sands in America are mined in the Ottawa-Wedron region of Illinois where all of WEDRON'S sands are produced.

See WEDRON about your next sand requirements!

MINES AND MILLS IN THE OTTAWA-WEDRON DISTRICT
WEDRON SILICA COMPANY
38 SO. DEARBORN ST. CHICAGO 3, ILL.

(*Continued from page 224*)

Leonard Gratz, C & O Pattern Works, Milwaukee, were re-elected.

Newly elected directors to serve three-year terms are: Martin Ehrman, International Harvester Co., Milwaukee; J. A. Gitzen, Delta Oil Products Co., Milwaukee; and Anthony Herrmann, Belle City Malleable Iron Co., Racine.

Following dinner the group divided into four sections for technical discussions. Harold W. Ruf, director of research and development of Grede Foundries, Milwaukee, talked on "Nodular Iron." Chairman was Norman Amrhein, Federal Malleable Co., West Allis, Wis. The nonferrous and pattern group heard Don M. Gerlinger, Walter Gerlinger Inc., Milwaukee, present a "Progress Report on the Technique of High Pressure Molding." Lawrence Andres, Lawran Foundry Co., Milwaukee, served as chairman.

"Control of Electric Furnace Melting Practice for Making Carbon and Alloy Steels" by Arthur Gross, metallurgist for Ohio Steel Foundry Ordnance plant and assisted by Ray Flemming, melting superintendent for that organization, attracted considerable attention. John McBroom, Stainless Foundry & Engineering Co., Milwaukee, served as chairman.

A panel discussion of gray iron problems was featured for that group. Cliff Schwann, was chairman and Prof. Richard W. Heine, University of Wisconsin, Madison, was moderator. Serving as a panel were C. W. Schwenn of the Brillion Iron Works Inc.; D. W. Hutchinson, Nash-Kelvinator Corp.; J. Schwengel, Modern Equipment Co.; Tom Tanner, Zenith Foundry Co.; Leo Koenig, J. I. Case Co.; Frank Kulka, Motor Castings Co.; Ed Zick, J. E. Gilson Co.; Les Woehlke, Grede Foundries Inc., and E. C. Wussow, Kaukauna Machine Co.—*John E. Hubel*

Northeastern Ohio

TWO interesting talks, one by Charles E. Nelson, technical director, Magnesium Department, Dow Chemical Co., Midland, Mich., and the other by Prof. Howard F. Taylor, Department of Mechanical Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., were presented at the Apr. 9 meeting of Northeastern Ohio Chapter of the AFS.

In his talk, "Getting the Most out of Light Alloy Castings," Mr. Nelson stressed the ever increasing use of aluminum and magnesium alloys and the need of the foundry industry to

(*Continued on page 230*)

More than 35 years
molten iron for better

Famous
CORNELL CUPOLA FLUX
OK'd by leaders in foundry industry
through years of constant service.

tion of risers, the difficulties that

success in cleansing
castings, reduced scrap

IN BOTH GRAY IRON FOUNDRIES AND MALLEABLE FOUNDRIES WITH CUPOLAS.

Famous CORNELL CUPOLA FLUX

The metal cleanser that has eliminated the chief cause of many casting rejects (foreign matter in molten iron and improper fluidity)

Outstanding foundries from coast to coast and Canada report that Famous Cornell Cupola Flux plays a very important role in their production—because it has proved the key to greatly reduced time and labor loss and minimum delays in shipment.

AN INSPECTION OF RESULTS FROM USING FAMOUS CORNELL CUPOLA FLUX SHOWS THE FOLLOWING FACTS:

- Cleaner, hotter and more fluid iron makes sounder, cleaner castings.
- Sulphur is greatly reduced. Slag is kept fluid.
- Machinability of castings is greatly improved.
- More efficient cupola operation.

THE CUPOLA before using Famous Cornell Cupola Flux.

e-Measured Scored Brick Form akes its use as easy as this.

THE CUPOLA where Famous Cornell Cupola Flux is used.

● ADVANTAGES OF SCORED BRICK FORM:

No digging out of container. No weighing. No measuring. No waste. You simply lift Famous Cornell Cupola Flux from container and toss it into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller charges, as per instructions.

CUPOLAS ARE CLEANER

Down Time and Maintenance Cost is Greatly Reduced

Your cupola maintenance man will have little to do when you use Famous Cornell Cupola Flux. Cupolas are cleaner, bridging over is practically eliminated, and a glazed or vitrified protective surface which is formed on cupola lining, greatly reduces erosion of brick or stone and minimizes patching and repairing.

WRITE FOR BULLETIN NO. 46-B

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

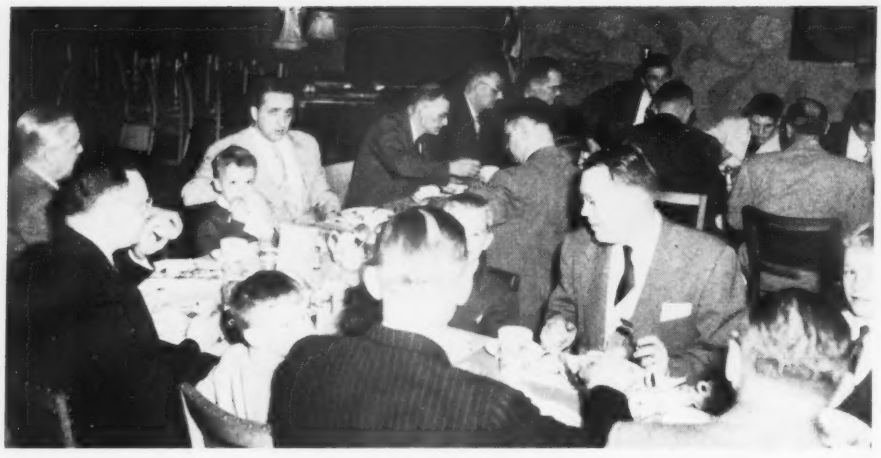
FAMOUS CORNELL FLUXES
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.



NORTHWESTERN PENNSYLVANIA Chapter of the AFS held a Father and Son Night recently at which Richard D. Agresti, Erie attorney and a commissioner of Little League baseball, discussed the formation and activities of Little League teams. Mr. Agresti is third from the left rear, in the light suit

(*Continued from page* 227)

capitalize on developments in the field of light metal castings in order to compete with the great presses that are being built for forgings. Recounting the advantages aluminum and magnesium offer, including the fact that there are plentiful sources of both, Mr. Nelson gave some startling figures about the availability of magnesium which is processed from sea water.

If 100 million tons of magnesium were taken from the seas each year for 1 million years, the magnesium content of the seas would drop only from 0.13 to 0.12 per cent. If all the magnesium in the seas could be extracted and spread evenly over all the land surface of the planet, it would form a layer 9 ft deep.

Professor Taylor discussed the function of risers, the difficulties that arise from improper risering and means of avoiding risering problems. Adequate feeding, correct placement and choice of the most suitable type of riser were among the points emphasized. He discussed all of these factors in relation to various metals and alloys, and pointed out the need to vary risering methods with the use of different casting materials. Much of his talk was devoted to the uses of chills, insulators, exothermic materials and other aids to correct risering.—*Jack C. Miske.*

Northern California

CONSIDERATION of waste disposal problems, in particular smoke abatement, held the attention of the 75 members of Northern California Chapter of the AFS at the Apr. 20 meeting held at Hotel Shattuck, Berkeley, Calif.

The speakers, Ray W. Hawksley and William J. O'Connell, have been working with local authorities and government agencies toward developing better understanding among these groups of the needs of industries for development and expansion. George Stewart, East Bay Brass Foundry,

(*Continued on page* 232)

Steel Founders' Society Honors Foundry Executives

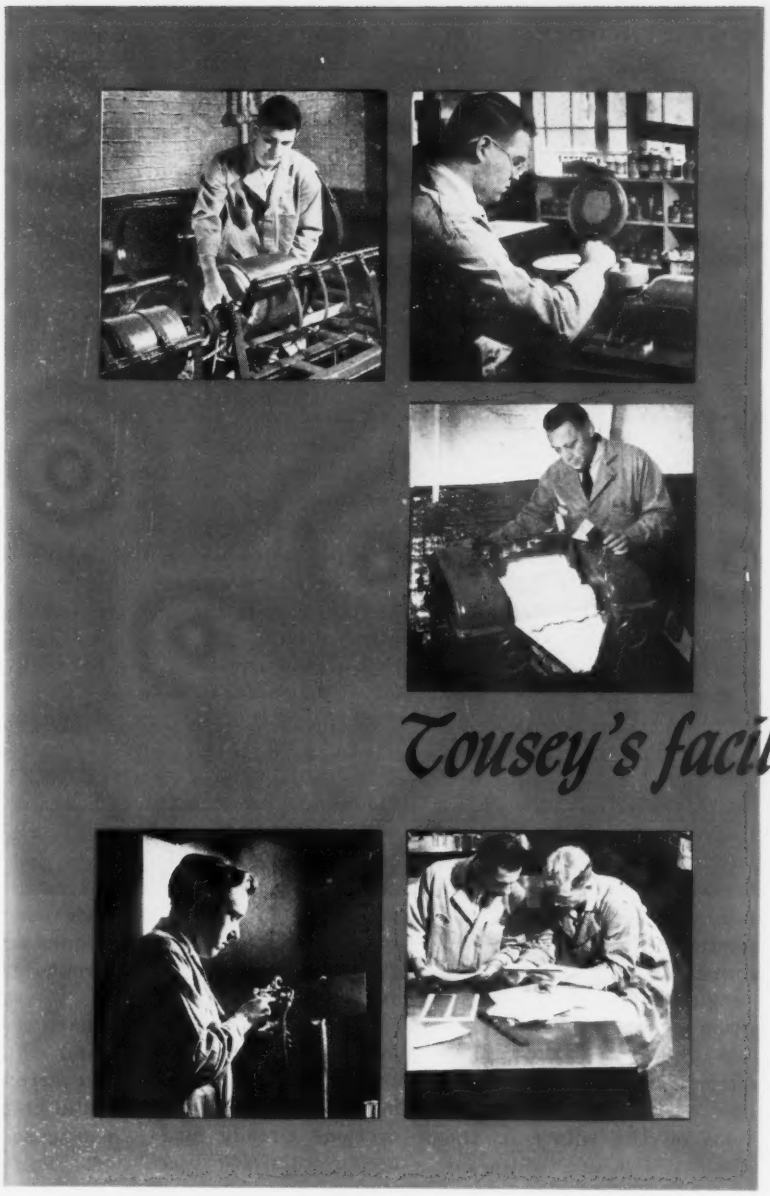
THREE steel foundry executives were honored by Steel Founders' Society of America, Apr. 17, at a special dinner meeting in the Warwick Hotel, Philadelphia. Nearly 100 executives of society member companies attended.

Honored were A. J. McDonald, vice president in charge of the Washington office, American Steel Foundries, Chicago; A. M. Andorn, executive vice president and treasurer, Penn Steel Castings Co., Chester, Pa., and G. Rhoads Casey, president and general manager, Treadwell Engineering Co., Easton, Pa. Mr. McDonald, active in the industry for over 30 years, is national SFS president. Until December he had served for over two years in Washington as Chief of the Castings Section, Iron and Steel Division, National Production Authority.

Mr. Andorn, 36-year veteran in industry, was society president in 1945 and currently is a member of the national research fund committee. Mr. Casey, with 42 years of industry service was a society board member through several terms, and served as vice president and executive committee member of the society during the period 1950-51.

Sessions held during the afternoon preceding the dinner were devoted to technical discussions led by Charles W. Briggs, society technical and research director, who delivered a paper on "Management Aspects of Shell Molding."

In the views above, left to right, are: Clarence Tolan, Dodge Steel Co., Tacony, Pa., presenting a gift to Mr. McDonald; Ray Munson, Atlantic Steel Castings Co., Chester, Pa., and Mr. Andorn; G. Clymer Brooke, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., and Mr. Casey, Treadwell Engineering Co.



Tousey's facilities for fine finishes

Personnel, equipment and know-how are three of the most important things in the development of fine finishes. At TOUSEY we have all three. Your paint problem is thoroughly studied by competent technicians whose long experience aids them in suggesting the proper formula for a finish best suited to your specific requirements. The pilot formula is tested against your specifications in a completely equipped physical testing laboratory, before being produced for shipment. This painstaking attention to detail is a most important part in Tousey's development of fine finishes.

TOUSEY VARNISH COMPANY

520 W. 25th Street • Chicago 16, Ill.

TOUSEY PRODUCTS

DURACOTE for DURABILITY

(*Continued from page* 230)
Richmond, Calif., and chapter chairman, presided.—*Clayton D. Russell, Phoenix Iron Works.*

Washington

PRINCIPAL speaker at the Mar. 19 meeting of Washington Chapter of the AFS, held at Monte Cristo Hotel, Everett, Wash., was William S. Pellini, head of the Metal Processing Branch of the Naval Research Laboratory, Washington. His subject was "The Feeding Range of Risers."

Mr. Pellini showed some excellent colored slides illustrating his subject. He demonstrated how metals freeze through a mushy state before complete solidification takes place, and pointed out that as castings freeze, dendrites, or branched tree-like crystals of solid metal, grow progressively from the casting skin toward the center The liquid surrounding the columnar crystals is in a mushy state and does not travel with ease between the maze of solid crystals.

Where the growth of dendrites proceeds at a simultaneous rate and the crystals meet in the center, feed metal from the riser or from heavier adjacent areas is hindered. Since the mushy area has been isolated during the final period of solidification, and metal shrinks as it

(*Continued on page* 234)

MIT STUDENT CHAPTER IS ACTIVE GROUP

By RUSSELL A. CHIHOSKI, *Technical Secretary,* MIT Chapter, AFS

MEMBERS of the student chapter of the AFS at Massachusetts Institute of Technology are sold on the foundry business. Their friends and contacts realize and admit that the chapter members know their industry better than most of the other student engineers. This knowledge is gained through contact with men from the industry who often attend the student chapter meetings. In addition, most of the students engaged in foundry study have corresponded with the Foundry Educational Foundation or with foundries in all sections of the country in seeking summer foundry work.

The chapter elects its president, vice president, secretary-treasurer and technical secretary to carry on the business of the chapter, keep records and provide for facilities used by the group. As administrative cadre these officers are alert to interesting ideas and projects, and they guide and co-ordinate the interest and enthusiasm of the members.

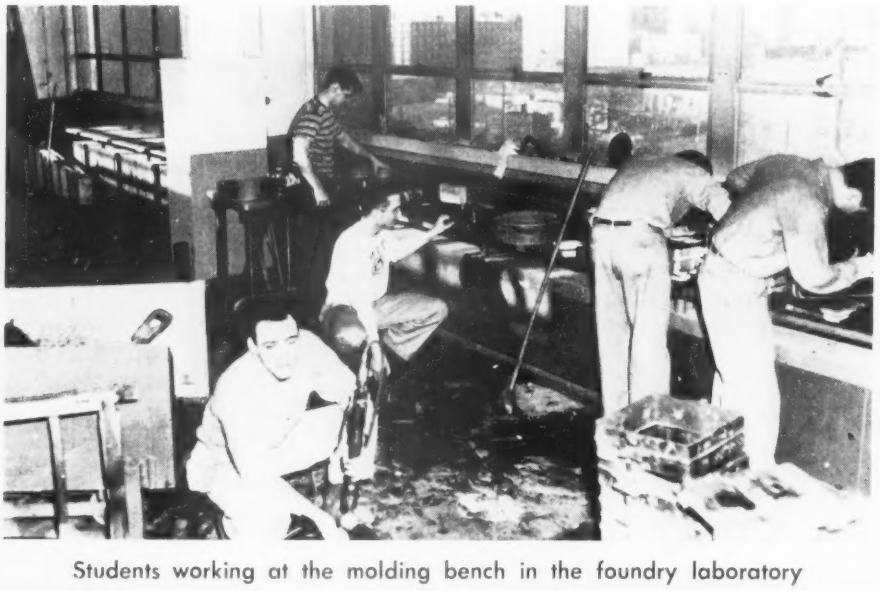
About four times each semester the chapter arranges dinner meetings at which a technical speaker is featured. This speaker usually discusses new developments, ideas or techniques in the foundry industry to keep the chapter membership informed of developments and to provide subjects for investigation by some of the members. Often members of the New England Foundrymen's Association attend the chapter's meetings; and every month student chapter members are guests at their dinners.

To create interest in the AFS Chapter meetings among nonmember students enrolled in metallurgy, mechanical engineering and business administration sections, the members set up posters, distribute announcement leaflets and often are invited to speak briefly at the beginning of class on the future of the foundry industry and the future for engineers in the industry.

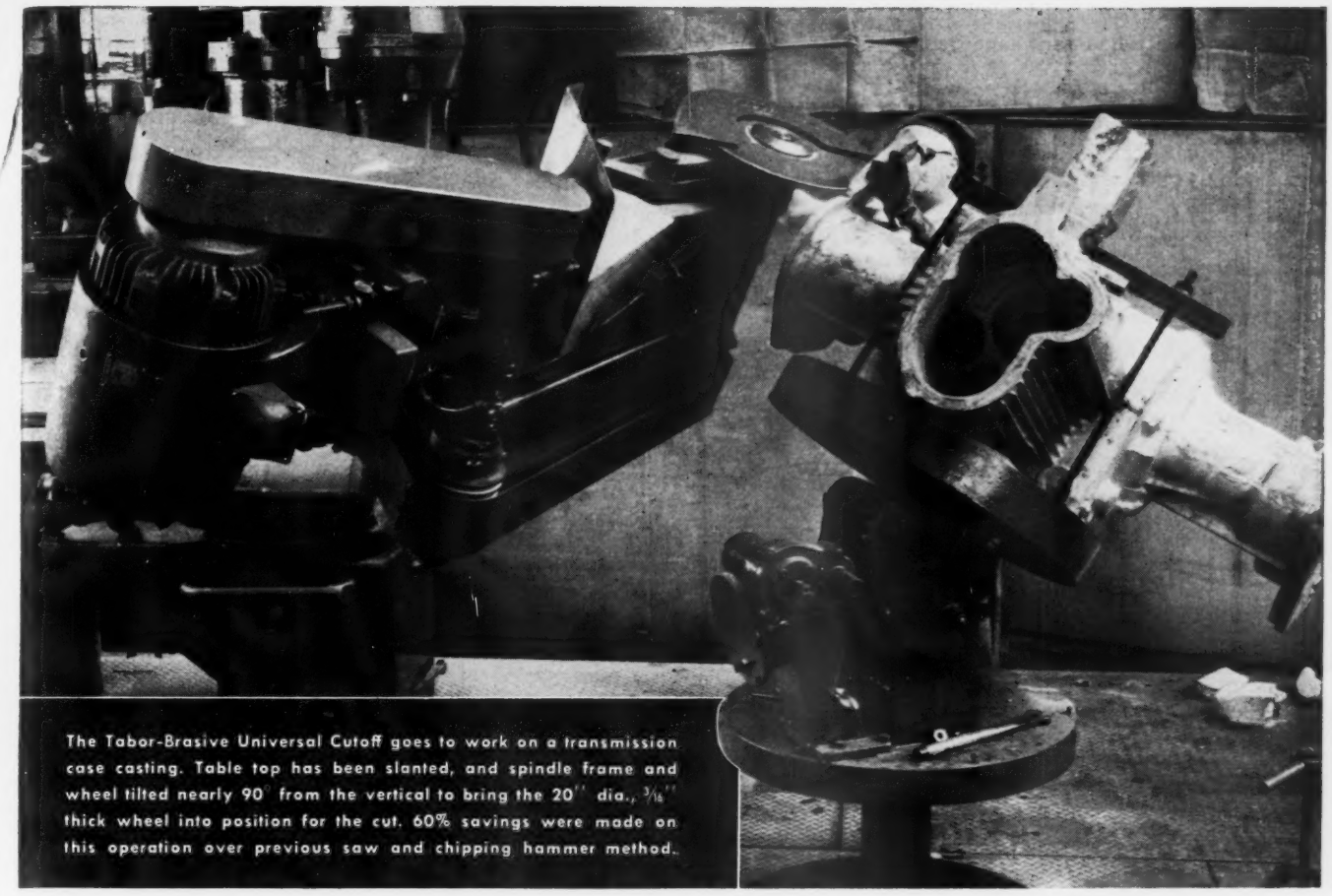
An important activity of the chapter is the planning and execution of the Saturday run in the institute's experimental foundry. Saturday mornings a group of ten to 15 students meet and conduct a programmed run for the day. While anyone in the school may be a member of the experimental foundry—the only requirement being that members help run the foundry and clean up in the afternoon—the foundry's accomplishments are entered as AFS Chapter achievements. The entire program, including the decision as to what metal will be poured, how much, what experiment will be made and what melting equipment will be used, is laid out by AFS members. Cost of the metal is insignificant and profit is the experience gained in producing castings which range from book ends to plaques and even castings required by young inventors.

During a typical Saturday run, after the molding is done and while the metal is being melted, everyone is called to a corner where the preparations already made are discussed and results are speculated. Sometimes a competent expert, who might be an instructor or graduate, is induced to join in and discuss the phenomena related to the day's work. The discussion following the shakeout supplements this and offers in part an explanation of the results. During the year several bulletins are prepared and distributed which discuss the runs, draw conclusions and make suggestions for improvement of the work.

Once each semester an AFS and experimental foundry membership drive is staged. A more elaborate advertising program is developed with a climax demonstration of a Saturday run in the foundry. Capturing theatrics include use of the sand-slinger, magnesium inoculation and riso-therms; and for those more seriously considering their place in American industry, a dinner is arranged where these students have the opportunity to meet and talk with foundrymen and learn more about the industry from speakers.



Students working at the molding bench in the foundry laboratory



The Tabor-Brasive Universal Cutoff goes to work on a transmission case casting. Table top has been slanted, and spindle frame and wheel tilted nearly 90° from the vertical to bring the 20" dia., 3/16" thick wheel into position for the cut. 60% savings were made on this operation over previous saw and chipping hammer method.

We have abrasive cutoff machines in our blood!

How else could our staff design and build the machine shown—a giant that does almost the impossible.

It cuts gates, fins, and risers at just about any angle, from almost any shape of casting, within a 220-square foot working floor area.

"Flexibility," you ask? The main column moves back and forth. The arm swings completely around the column. The spindle frame swings 270° around the end of the arm and rotates 90° either way from vertical. The cutting table handles castings weighing up to 500 pounds. Table unit raises and lowers hydraulically and rotates 360° on its vertical axis. Table top also rotates about its center and tilts 90°. As many as four tables can be incorporated in the unit. Except for the chopping or cutting action, all movements are electrically controlled and spring-locked.

Such an example of design skill serves to reaffirm that Tabor is a good place to go for abrasive cutoff machines. Our standard line covers foundry and metalworking units—from 3 H.P. on up. Complete bulletins and data for the asking.

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H. Reich, Trussville, Ala.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

THEY'RE CUT OUT...TO CUTOFF!

EXPORT DEPARTMENT, 765 DREXEL BLDG., PHILA. 6, PA.

(*Continued from page* 232)
solidifies, a centerline shrinkage void will be present.

The problem, according to Mr. Pellini, is to eliminate these zones of simultaneous freezing. Experimental results indicate that a riser will feed on flat plate castings a distance from its center equal to 2T (T being casting thickness). Mr Pellini also stated that the end wall of the casting influences the temperature gradient on cooling and this he termed "edge effect." Extracting heat from the casting by the end mold wall in addition to the top, bottom and sidewalls produces more rapid freezing and this has been determined as 2½T.

Thus if a riser is placed so that its feeding distance—2T—reaches to the zone where the edge effect operates, there will be progressive solidification from the end of the plate to the riser connection, and a casting without centerline shrinkage will be produced. If the total distance is greater than 4.5T, centerline shrinkage will appear when the casting is subjected to radiographic examination.

The speaker then stated that chills extract heat 12 times as fast as sand surfaces. Chills equal in thickness to T will increase the end effect on freezing by 2T. An added advantage can be gained by placing a surface chill between adjacent risers to create an artificial casting end for both risers, increasing the feeding range of each riser.—*Harold R. Wolfer, Puget Sound Naval Shipyard*

SAFEST MALLEABLE FOUNDERS: Winners of the Malleable Founders' Society self-improvement awards are shown above as they received awards for having made the greatest reductions in accident frequency rates in their respective groups, which are based on numbers of employees. Top view, Lowell D. Ryan, center right, executive secretary of the society, presents a safety certificate to Joseph W. Weigel, safety committee chairman, Columbia Malleable Casting Corp., Columbia, Pa. Center, Fred Head, of the society, right center, presents a certificate to Guy Jenner, personnel and safety director, Marion Malleable Iron Works, Chicago Railway Equipment Co., Chicago. Bottom, Mr. Head, left, presents William J. Blackmore, president, Richmond Malleable Castings Co., Richmond, Ind., with his firm's certificate. The fourth winner, not shown here, was the Oakland plant of General Metals Corp., Los Angeles

Northwestern Pennsylvania

MEETING at Corry, Pa., on Apr 10, 50 members of Northwestern Pennsylvania Chapter of the AFS participated in a visit to the Ajax Iron Works during the afternoon. Robert Jordan, foundry superintendent, and his assistants divided the visitors into small groups so that everyone would be able to get all the information desired on the trip through the foundry and machine shop.

William H. Sparr, International Nickel Co., spoke at the evening meeting held at Hotel Corry on "Engineering Properties and Applications of Ductile Iron."—*Roy A. Loder, Erie Malleable Iron Co.*

Rochester

A REVIEW of foundry progress was presented by Donald J. Reese, International Nickel Co., New York, at the Apr. 7 meeting of Rochester Chapter of the AFS at the Seneca Hotel, Rochester, N. Y.

Mr. Reese reviewed the progress of the industry for the past seven years. He said that shell molding is changing methods in the manufacture of castings and seems to be a practical means for a portion of the industry to decrease man-hours per ton of product and to reduce dust. New bonding materials are being developed so that cores will set at air or room temperature. Mr. Reese believes the progress in the industry during the past ten years is greater than any other period's.—*Herbert G. Stellwagen, Hetzler Foundries Inc.*

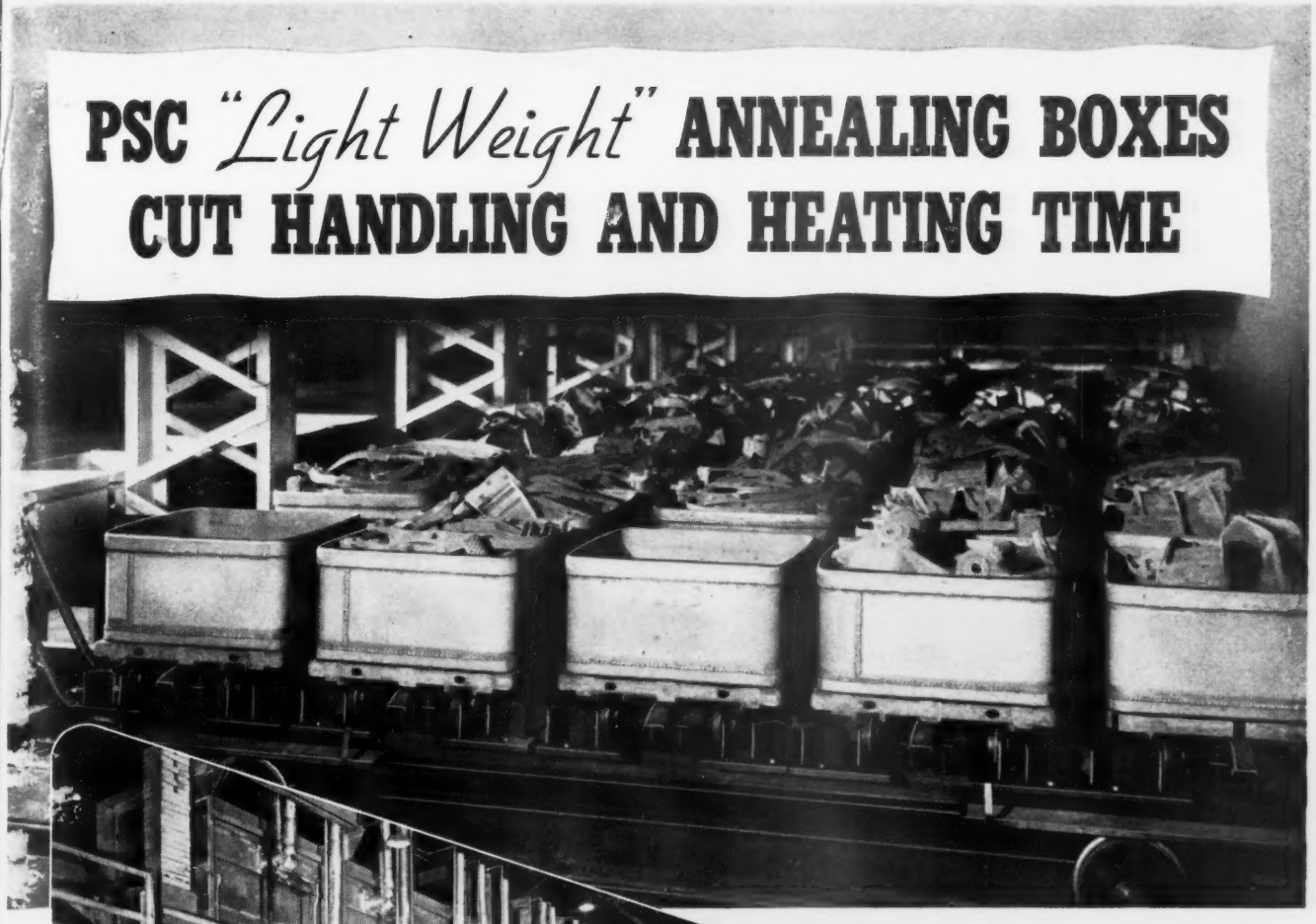
Birmingham

MEMBERS of Birmingham District Chapter of the AFS devoted an entire evening to presenting prizes, looking at contest patterns and castings, and hearing comments from the contest judges at its Apr. 17 meeting held at the Tutwiler Hotel, Birmingham.

Tom H. Benners Jr., chairman of the Education Committee, presided at the symposium. First speaker was V. I. Byford, superintendent of production, Foundries Division, Jackson

(*Continued on page* 236)

PSC *"Light Weight"* ANNEALING BOXES CUT HANDLING AND HEATING TIME



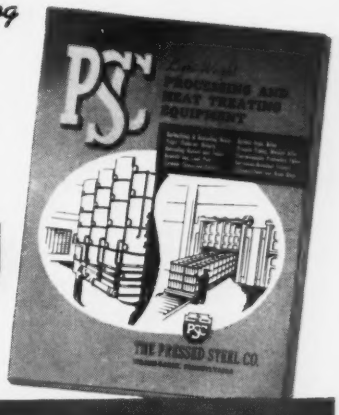
Left, a battery of 3 HOLCROFT overhead malleablizing furnaces at a large midwest foundry. Above, PSC boxes on the floor level, ready for elevating into a furnace.

Designed for use with conveyor-fed furnaces, the above PSC "Light-Weight" annealing boxes handle rapidly and easily through any load, unload, transfer or switch movement possible on a 90° conveyor.

Weighing only a small fraction of their 500-lb. load, these PSC "Light-Weight" containers not only save handling time but also effect impressive savings in heating time and fuel. Size 24" x 24", they are pinned to trays fitting roller rails. Fabricated of the sheet alloy which best stands the atmosphere and temperature conditions, these boxes have been in continuous 60-hour anneals for a great many months without significant distortion or embrittlement. PSC sheet alloy equipment fabricated for every purpose: annealing and carburizing boxes, covers, baskets, fixtures, retorts, tubes, etc.

Send for Heat Treating Catalog 52

A new standard reference



THE PRESSED STEEL COMPANY
of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

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SAGINAW VALLEY Chapter of the AFS had a group at its April meeting from the Eaton Mfg. Co., Foundry Division, Saginaw, Mich., including, left to right, George Frye, Howard Johnson, Robert Allison, George Deland, Harold Franko, Alex Hubbard, Howard McClelland, Paul Olson and Clifford Hornfield

(*Continued from page* 234)

Industries Inc., who spoke on "What Makes a Good Casting." Using the apprentice-made castings to illustrate his points, he discussed the special types of gates used and how each met different needs.

J. L. Corley, Southern Precision Pattern Works in his talk, "Some Fine Points of Good Patterns," emphasized the importance of apprentice training and the development of skilled men in all trades. Mr. Corley recalled he had been a winner in a Birmingham AFS apprentice contest 12 years ago. Oscar Wyatt, Acme Pattern Works, and one of the judges in the local contest, stressed the necessity of complete accuracy in patternmaking.

Local contest winners were as follows: Gray iron—V. L. Bradford, Stockham Valves & Fittings Inc.; Paul W. Townes Jr., American Cast Iron Pipe Co.; Lewis M. Jessup, University of Alabama; Steel molding—Miles C. Stephens, Dewey E. Myers and Harry D. Bradshaw, all of the University of Alabama; Nonferrous molding—Sinclair Latham, Mark C. Gregoire and Jarrette A. Hamilton, also from the University of Alabama. In patternmaking, both metal and wood, all winners were from Stockham Valves & Fittings. Winners in the metal division were: A. O. Eidson, Jeff Bell and T. H. Belcher; in the wood division they were J. L. Cummings, R. O. Worthington and D. E Humphrey.—*J. P. McClendon, Stockham Valves & Fittings*

Eastern New York

MEETING jointly with the Eastern New York section of the American Society for Metals, the Eastern New York Chapter of the AFS had as the featured speaker Richard Herold, manager of the Foundry Products Department of Borden Co., New York. A capacity audience of 90 was present at Circle Inn, Lathams, N. Y., for the meeting.

Mr. Herold presented an excellent

(*Continued on page* 238)

SOUTHERN CALIFORNIA Chapter of the AFS was happy to learn at its Apr. 10 meeting that the first and second prize winners in the chapter's apprentice molding contest also had won the first and second prizes nationally. Top left, left to right, are Charles Gonzales and Joseph Lo Patriello, both of AiResearch Mfg. Co., Los Angeles, the second and first prize molding winners respectively, and Anthony Tuzzolino, Overton Foundry, Southgate, Calif., who worked with the winners. Top right, left to right, are Philip Campbell, Campbell Pattern Works, with Phil Campbell, Campbell Pattern Works, and Martin Stovich, first and second prize patternmaking winners respectively. On far right is Robert Hall, Santa Monica Technical School, who assisted contestants. Bottom, left to right, are Mr. Campbell; Henry Howell, Howell Foundry Co., Los Nietos, Calif.; Chapter President Harold Pagenkopp, Angelus Pattern Works, Huntington Park, Calif.; Treasurer William Baud, Mechanical Foundries Co., Vernon Calif.; John E. Wilson, Climax Molybdenum Co.; R. A. Quadt, Hunter Douglas Corp., Riverside, Calif., speaker; Vice-President Hubert Chappie, National Supply Co., Torrance, Calif.; and Alfred Grant, Grant & Co., Los Angeles. Photos by K. F. Sheckler, Calmo Engineering Co.

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ST. LOUIS Chapter of the AFS met during April. Discussing the foundry educational foundation program at Missouri School of Mines & Metallurgy, Rolla, Mo., are, left to right, E. J. Aubuchon, M. A. Bell Co.; Robert Wolf, instructor in metallurgy, and Webb L. Kammerer, Midvale Mining & Mfg. Co.

(*Continued from page* 236)

review of the shell molding process's progress. He stated that if the part can be improved as to dimensional finish and there is a reasonable quantity to be made, shell molding should be considered. He highlighted his talk with a number of sample castings made in shell molds and illustrated his talk with slides.

Stan B. Terhune, Watervliet Arsenal, followed with a description of work being done in the area with shell molds. The speakers answered many questions by both foundrymen and users of foundry products.

On Apr. 21 the Eastern New York Chapter sponsored a plant visitation to the Adirondack Foundries & Steel Corp., and a meeting on "Sand Control" in the evening. Approximately 20 members were able to make the tour of the plant as guests of Cliff Apgar, plant manager, Chet Richard, chief metallurgist, and Leigh Townley, metallurgist at Adirondack and also chapter chairman. The group was chiefly interested in the operation of the steel foundry as well as the quality control tests for tensile and impact strengths being conducted in the laboratory.

Frank Brewster, vice president, Harry W. Dietert Co., Detroit, outlined the means by which sands can be controlled in a foundry, in his talk "The Why and How of Sand Control." The 60 members present at the meeting developed a lively question period following his presentation.

As a result of the joint meeting with ASM in March, Newt Williams, George Pettinos Co., Philadelphia, presented Chairman Townley with a brass dinner bell and gavel. Mr. Townley accepted the gift on behalf of the chapter with deep appreciation —*A. J. Kiesler, General Electric Co.*

CENTRAL ILLINOIS Chapter of the AFS devoted its Apr. 6 meeting to a discussion of safety. Left to right are G. W. Harper, associate professor of mechanical engineering and safety education, University of Illinois; Dan Farrell, supervisor of safety, U. S. Steel Corp., Pittsburgh, speaker; and Technical Chairman H. S. Simpson, Caterpillar Tractor Co., Peoria, Ill.

Central Illinois

THE topic, "Scientific Management Principles Applied to Safety," was presented by Dan Farrell, supervisor of safety, U. S. Steel Corp., Pittsburgh, at the Apr. 6 meeting of Central Illinois Chapter of the AFS. The meeting ws held at American Legion Hall, Peoria, Ill.

Mr. Farrell pointed out that to achieve the objective of preventing industrial accidents, the mishaps must be analyzed similar to accounting and engineering reports. In making this analysis, Mr. Farrell found employees are injured either by being struck by something, struck against something or struck between something. Three materials are injurious to employees —solids, liquids and gases.

He recommended making a survey of accidents. As the accidents are noted, critical situations will become apparent and those with the most frequency and seriousness must be given the most attention. The points of contact where the employee was struck by, struck against or struck between must be eliminated by installation of guards or shields, changing methods, training, or use of safety equipment such as glasses, hoods or gloves.

Mr. Farrell said that by using the method, the company he represents had improved a good safety record in 1948 by reducing it by 59 per cent.— *L. E. Kinsinger, Caterpillar Tractor Co.*

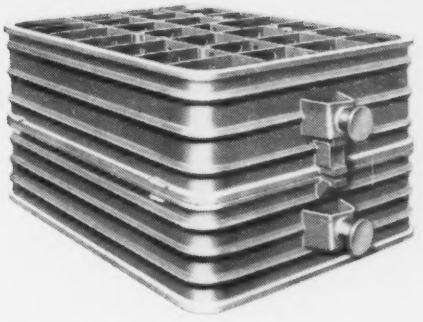
Saginaw Valley

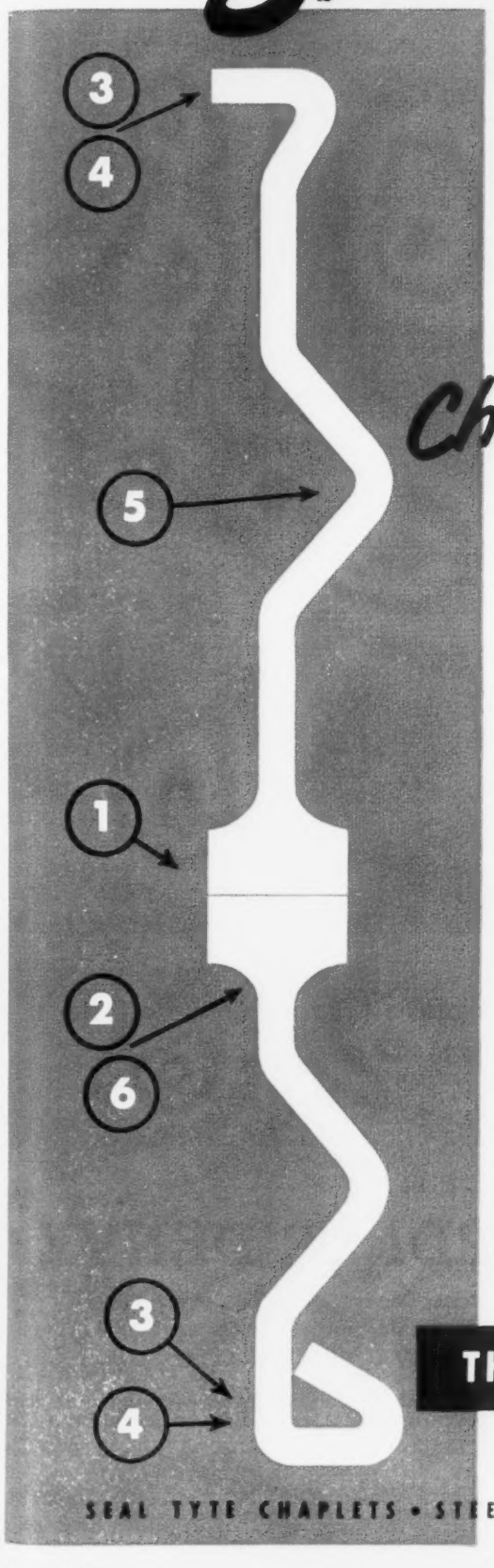
MILESTONE in the Progress of Cast Iron Metallurgy," was the subject of an address by J. S. Vanick, International Nickel Co., New York, at the April meeting of Saginaw Valley Chapter of the AFS.

Mr. Vanick described and also showed slides of some early smelting furnaces built in this country. Charcoal was used originally for melting;

(*Continued on page* 241)

A NEW STRONGER





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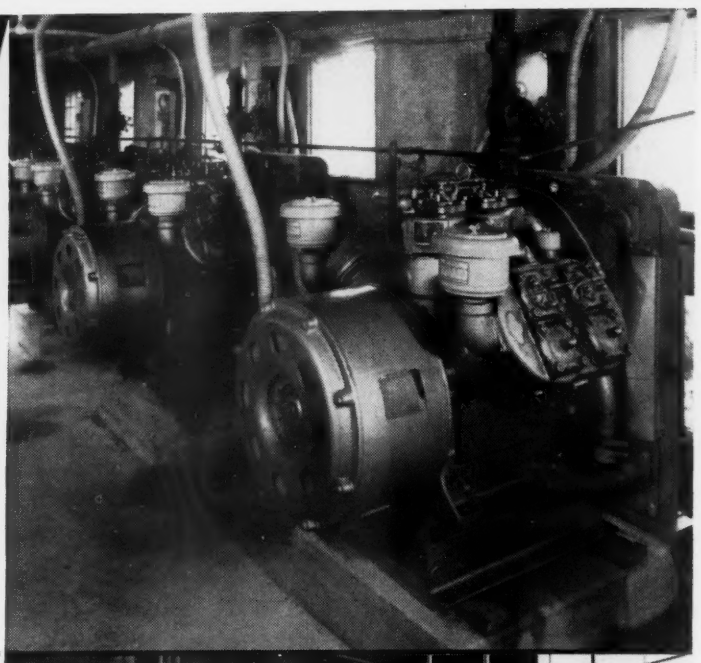

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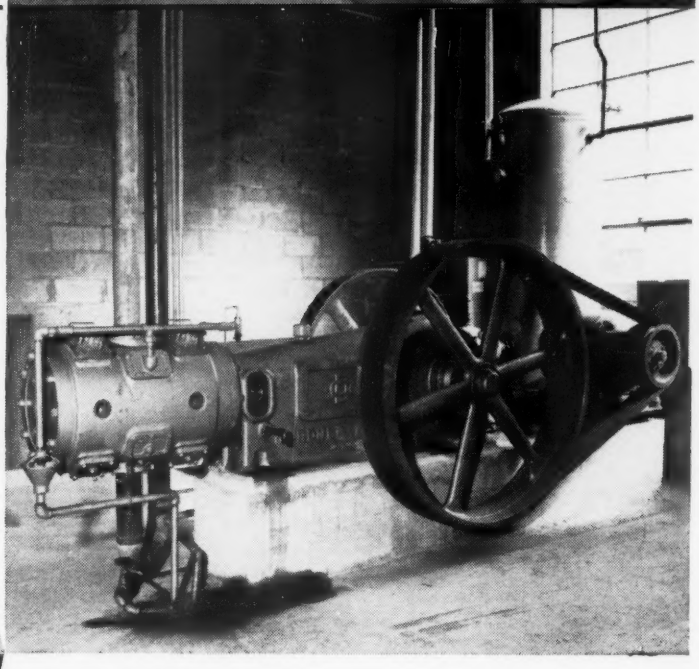

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(*Continued from page* 238)

anthracite coal, bituminous coal and coke followed later. Most of the time was spent in getting iron out of the furnaces and apparently little thought was given to metallurgy. Mr. Vanick indicated that the practice of remelting iron in a cupola started about 1750, and coke was developed at about the same time. Over 100 years elapsed, however, before furnace operators began to consider seriously metallurgy, physical properties and methods of testing iron.

The speaker presented slides showing a practical base chart of charge materials for operating metallurgists; effect of alloys on tensile strength, hardness and chill depth; ductile cast iron and the relationship between elongation, tensile strength and hardness of cast and ductile irons. Mr. Vanick believes that future developments in metallurgy will emphasize shape, size and distribution of graphite in iron.

Kenneth H. Priestly, Vassar Electroloy Products Inc., Vassar, Mich., and chairman of the chapter presided. —*Roy S. Dahmer, Eaton Mfg. Co.*

Chicago

THE April 6 meeting of the Chicago Chapter AFS was notable in two respects. It kicked off the initial activity of a newly organized group—the Maintenance Division—and it established the year's high point in attendance—in excess of 250. The former was pretty much responsible for the latter.

Chapter President John H. Owen conducted the business portion of the meeting, the final one for the current year because of national convention in Chicago May 4-8.

Roy W. Schroeder, chairman of the Educational Committee, reported

WINNER of first place in the metal pattern division apprentice contest of Detroit Chapter, AFS, is Walter Lewandowski of the Ford Motor Co.

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ALSO MAKERS OF FAMOUS STARRBIDE CARBON-BONDED CRUCIBLES, GRAPHITE CRUCIBLES AND SUPER REFRACTORIES.

briefly on the School of Gating and Risering which the chapter sponsored in March. Total enrollment for all divisions was 425. Attendance for the 12 sessions was 1350.

Deming H. Lucas, Pittsburgh Metals Purifying Co., and chairman of the Membership Committee, reported that the chapter would close its year with a 700 membership.

Officers for 1952-53, proposed by the nominating committee at the March meeting, were elected, there having been no additional nominations received, and took office May 31.

John A. Rassenfoss, research metallurgist, American Steel Foundries, who served during the past year as vice president and program committee chairman, is president-elect. New vice president is Robert L. Doelman, sales engineer, Miller & Co., who has served as secretary for two years. William L. Rudin, chief engineer, Elesco Smelting Corp., is the new secretary.

New directors are: Walter R. Jaeschke, consulting engineer, Whiting Corp.; J. E. Johnson, general superintendent, Continental Foundry & Machine Co.; Roy W. Schroeder assistant professor of foundry and pattern laboratory, Navy Pier Branch, University of Illinois; and Retiring President Owen.

After acknowledging his election as president, Mr. Rassenfoss presented the chapter's "Oscar," the past president's statuette to Retiring President Owen in recognition of his service during the past year.

The technical program for the evening consisted of four roundtable sessions. Of these, biggest share of attention was focused on the one sponsored by the new Maintenance Division, and representing the efforts of long planning by a committee headed by Harold L. Rekart, plant engineering, National Malleable & Steel Castings Co.

Initial session of this division attracted an attendance of about 65 and devoted its attention to "Maintenance of Sand Handling Equipment," with Frank Edwinson, chief plant design engineer, McCormick Works, International Harvester Co., as chairman. T. J. Glaza, superintendent of maintenance, Crane Co., was speaker, and the panel consisted of E. W. Greenless, superintendent of maintenance, Kensington Steel Co., and Frank B. Hall, electrical engineer, Beardsley & Piper Division, Pettibone Mulliken Corp.

Nonferrous and Pattern Divisions combined to discuss "Insulating Risers." Robert F. Dalton, development engineer, U. S. Gypsum Co., was chairman, and Michael Bock II, vice president, Exomet Inc., Conneaut, O., was speaker.

"Scrap Analysis" was the subject considered by the Steel Division. Discussion leaders included H. D. Hunt, foundry superintendent, Pettibone Mulliken Corp.; A. P. DiGirolamo, foundry foreman, Chicago Steel Foundry Co.; and Roy C. Nelsen, district manager, Sterling Wheelbarrow Co.

Gray Iron and Malleable Divisions joined forces to consider "Sand." Cecil F. Semrau, metallurgist, Illinois Malleable Iron Co., was chairman. The panel of experts comprised Harold G. Haines, general manager, Burke Industries; LeRoy E. Taylor, service engineer, Goebig Mineral Supply Co.; and J. S. Groh, Archer-Daniels-Midland Co.—*Erle F. Ross.*

Central Ohio

EFFECT of Gating Design on Casting Quality" is the title of the third and most recent film produced at Battelle Memorial Institute, Columbus, O., on the subject of proper gating. J. H. Jackson of the institute

(*Continued on page 244*)

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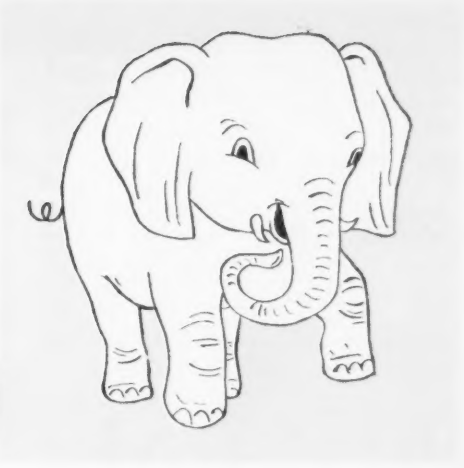
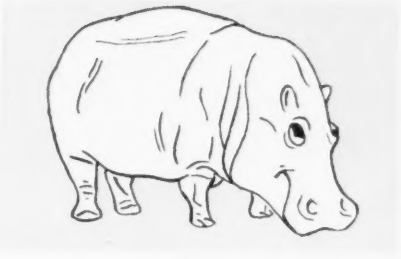


LITTLE

BIG



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(*Continued from page 242*)

presented this film at the Apr. 13 meeting of Central Ohio Chapter of the AFS held at the Seneca Hotel, Columbus. As in the previous work, plastic transparent molds were used so any entrained gases could be seen.

Certain changes in the gates and sprue made radical differences in the behavior of the fluid, which in this case was water. Mr. Jackson stated that a number of trials have been made with metals which prove a good correlation despite the differences between the fluids.—*Wilfred H. White*

Chesapeake

NODULAR iron was discussed by Richard P. Dunphy, Naval Research Laboratories, Washington, at the Mar. 27 meeting of Chesapeake Chapter of the AFS.

Mr. Dunphy explained that nodular iron does not fit all applications and more harm than good would be done if the material were to fail in a design where it does not belong. In nodular iron, the energy, charpy, fixture and ductility transition curves behave in a similar manner with a change in temperature. Chills may form hard spots but, in general, nodular iron machines as well as or even better than cast iron. Melting presents a few problems, one being the need of inert gases to keep the magnesium additions from oxidizing in the ladle.—*Joseph O. Danko Jr., Wabash Mfg Co.*

Ontario

HIGH interest among the members of Ontario Chapter of the AFS continued with more than 200 members and guests present to hear S. C. Massari, national technical director, speak in connection with the showing of Part III of the society's research film on fluid flow. Chapter Chairman Andrew Reyburn, Cockshutt Farm Equipment Ltd., Brant-

ONTARIO Chapter of the AFS heard a discussion of shell molding at its Mar. 21 meeting, at St. Catherines, Ont. C. Maddick, Massey-Harris Co., Brantford, Ont., was the speaker

ford, Ont., presided, and Jack King, Archer-Daniels-Midland Co. Ltd., Toronto, introduced the speaker.

The chapter's Mar. 27 meeting, held at St. Catherines, Ont., attracted 300 members, some coming from as far as Port Arthur, 400 miles away. During the day many availed themselves of the opportunity to visit the new multi-million dollar gray iron and malleable shops of McKinnon Industries Ltd. at nearby Merritton. Others visited Anthes-Imperial Ltd., and viewed the latest in pipe casting equipment.

The banquet room seating capacity of 225 was exceeded, so many had to eat elsewhere and return for the technical session. During a short business meeting, Alex Pirrie, Standard Sanitary & Dominion Radiator Ltd., Toronto, was elected chapter chairman; Fred J. Rutherford, Refractories Engineering & Supplies

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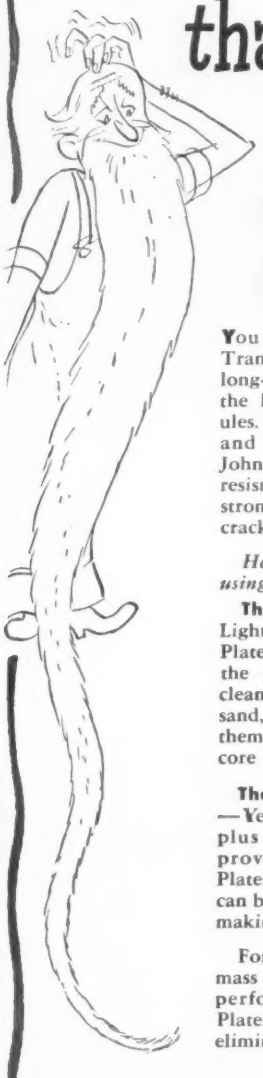

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Ltd., Hamilton, vice chairman and Gerald L. White, B. L. Smith Publishing Co., was re-elected secretary-treasurer.

Newly elected directors include John Allan, Callander Foundry & Mfg. Co. Ltd., Guelph, Ont.; Herbert Fairfield, Wm. Kennedy & Sons Ltd., Owen Sound; Norman Bennett, Canadian General Electric Co. Ltd., Toronto; and Frank Kellam, Electro Metallurgical Co. Ltd.

To top off the day, Cecil Maddick, Massey-Harris Co. Ltd., Brantford, spoke on "Shell Molding." Speaking with the authority of a pioneer in the field, Mr. Maddick pointed out the need for additional research on the method.—*F. J. Rutherford, Refractories Engineering & Supplies Ltd.*

Detroit

A VISIT to the Ford Cleveland Foundry was arranged for members of the Detroit Chapter of the AFS on Apr. 17. The chartered bus trip originated at the Ford Motor Co. Rouge plant. There were 155 members of the Detroit Chapter who made the trip and they were joined by 28 members of the Toledo Chapter.

On arrival at the plant, the group was taken on a conducted tour of the coreroom, melting, molding, cleaning and other facilities, after which an excellent dinner was served in the company cafeteria. Claude Jeter, plant manager, briefly discussed the foundry and introduced the management staff. The group returned to Detroit by bus that evening.—*Walter P. Kantzler, Kelsey-Hayes Wheel Co.*

Connecticut Non-Ferrous

MORE than 100 members of Connecticut Non-Ferrous Foundrymen's Association visited the Electric Boat Co. Division of General Dynamics Corp. at Groton, Conn., Apr. 15. They were privileged to see the production of a large centrifugal casting in the organization's foundry. In addition, the group was able to tour the U.S.S. *Guardfish*, one of the largest submarines at the base in New London. A dinner meeting at Hotel Mohican, New London, Conn. concluded the day's activities.

The association will hold its annual outing at Restland Farms, Northford, Conn. on June 19. Arrangements are being made by a committee headed by George Calligan, American Refractories & Crucible Co., North Haven, Conn., and George Liff, Klein-Farris Co., Hartford, Conn.—*Louis G. Tarantino, Niagara Falls Smelting & Refining Co.*

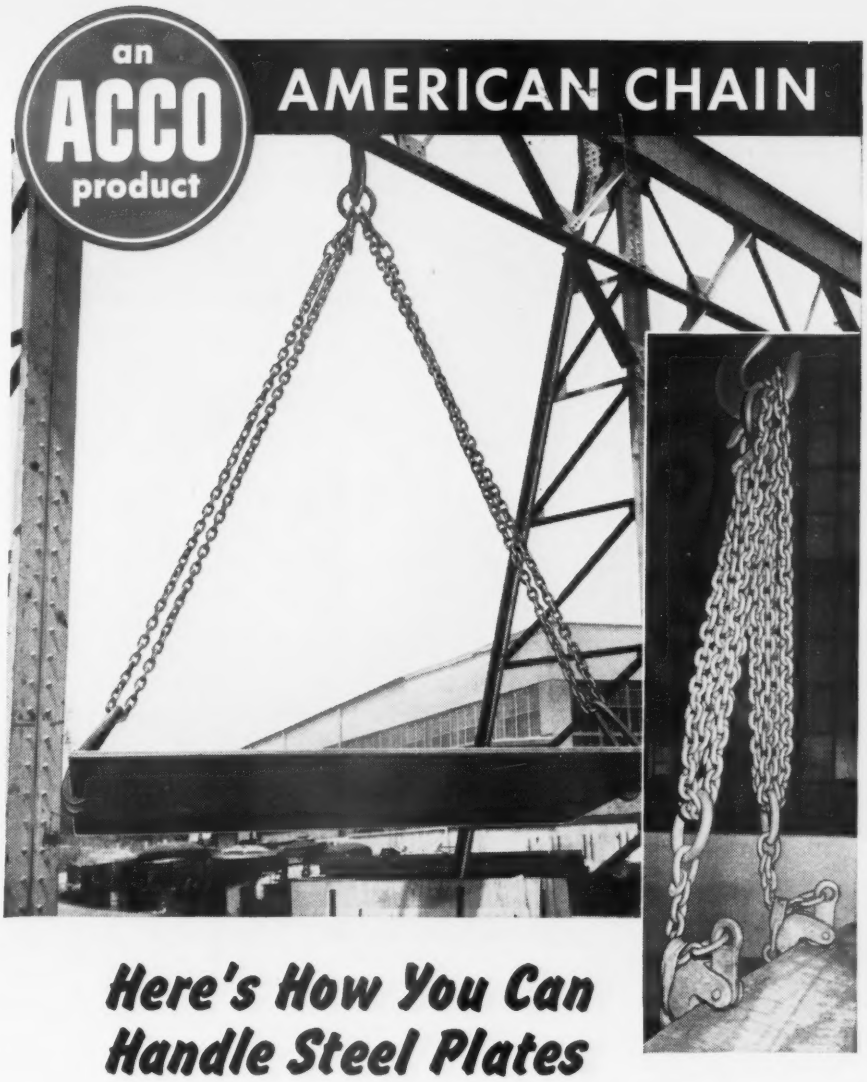

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Illustration: Mr. George Garvey of City Pattern and Foundry, South Bend, Indiana observing the checking of an "ACCURATE" cope and drag set for an M. B. Skinner Co. 12" split coupling used for repairing broken cast iron mains.

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Industry Briefs

GENERAL Credit Inc., Washington, has sold General Magnesium Foundries Inc., Belleville, Ill., its wholly owned subsidiary, to Bremner Bros., Chicago. A. Burks Summers, president of General Credit, will continue to head the organization as executive vice-president of General Magnesium, which will operate as a division of Bremner Bros. C. O. Briner will continue as vice president and general manager and C. M. Saunders as assistant treasurer and comptroller.

* * *

Leeds & Northrup Co., Philadelphia, and S. A. Integra, Liege, Belgium, have formed Integra-Leeds & Northrup Ltd., Birmingham, England. The new firm handles business formerly conducted in Birmingham under the name of Integra Co., Ltd., which was a branch of the Liege firm and for some years has been the English agent for Leeds & Northrup products. The business now will be expanded to include manufacture of products of both companies.

* * *

Sandy Hook Foundry Inc., Phile Curtis Rd., Sandy Hook, Newtown, Conn., has been organized with Joseph Sherback as president and treasurer and Ethel C. Sherback as secretary. Both are of Bridgeport, Conn. With Kenneth J. Griffin, Westport, Conn., they also will serve as directors.

* * *

Plastics Division, Monsanto Chemical Co., Springfield, Mass., has renamed its new foundry resin for the elimination of clay balls in foundry sand. Introduced in January as Lustrex 886, the resin henceforth will be known as Lytron 886.

* * *

A. B. Chance Co., Centralia, Mo., will build a new foundry at a cost of about $250,000 for the production of nonferrous castings for switchgears, hot line tools and protective devices for the electric power and communications industries.

* * *

Dow Chemical Co., Midland, Mich., has opened a sales office in Minneapolis to serve Minnesota, northern Wisconsin and the Dakotas. At the outset, it will function as a branch of the Chicago office.

Ford Motor Co., Dearborn, Mich., is negotiating with the New York Central System to purchase a 142-acre site adjacent to the company's engine plant and foundry in Brookpark Village, a Cleveland suburb. A second engine plant proposed for the site will draw its castings from the foundry, which also supplies the existing engine plant.

* * *

Cutaway Harrow Co., Higganum, Conn., Division of Orkil Inc., was sold at public auction on May 5. The plant includes six buildings, a recently built gray iron foundry and machine shop equipment. The buildings contain over 40,000 sq ft of floor space.

* * *

Hanna Engineering Works, 1765 Elston Ave., Chicago 22, has appointed Barton Sales Co., 1609 West Third St., Fort Wayne, Ind., to handle sales of its products in northern Indiana, including Fort Wayne and South Bend.

* * *

United Compound Co., producer of vent wax for foundry cores, recently moved into a specially designed new factory at 611 Indian Church Rd., Buffalo 24. The company soon will announce a new type of vent wax which is said to resist hot weather.

U. S. Pipe & Foundry Co. plans to add about 10½ acres of usable land to its plant site at West 27th & Chestnut Sts., Chattanooga, Tenn., by raising the level of Ross Tower Island, in the Tennessee River, as much as 23 ft and by filling in the 50 to 75-ft strip of water that divides it from the mainland. The project will require about 600,000 cu yd of fill.

* * *

Electro Refractories & Abrasives Corp. has installed two new type periodic kilns for firing grinding wheels at its recently completed vitrified grinding wheel plant in Buffalo. Base of each kiln and its door are attached to railroad cars and form part of the furnace. Kilns are loaded and unloaded outside the furnace, and firing has been speeded up materially.

* * *

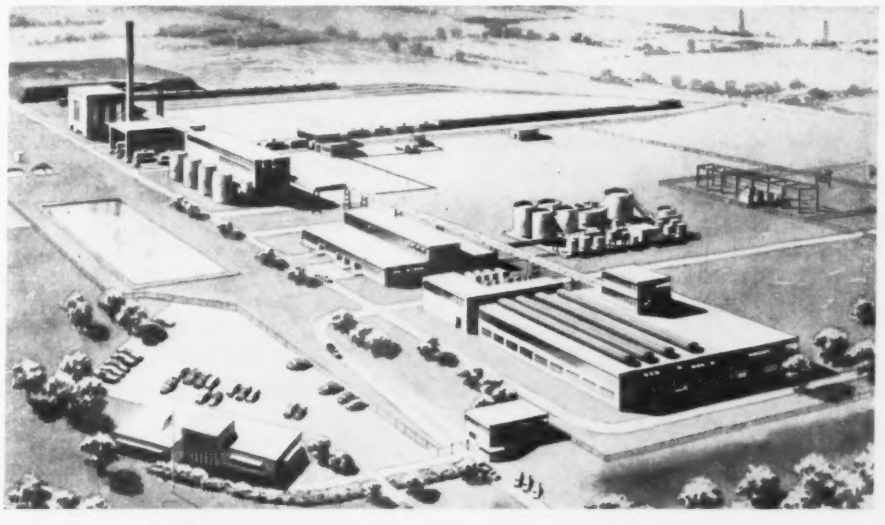
American Radiator & Standard Sanitary Corp., Pittsburgh, has opened a newly modernized cafeteria and two modernized and refurnished recreation rooms for the 4000 employees at its Louisville plant, the largest of the 46 the company operates.

* * *

Reconstruction Finance Corp.'s Chicago loan agency has approved a $70,000 loan to Barclay Foundry Inc., 1555 South Barclay St., Milwaukee. The funds will cover part of the cost of a new foundry building which is in the planning stage.

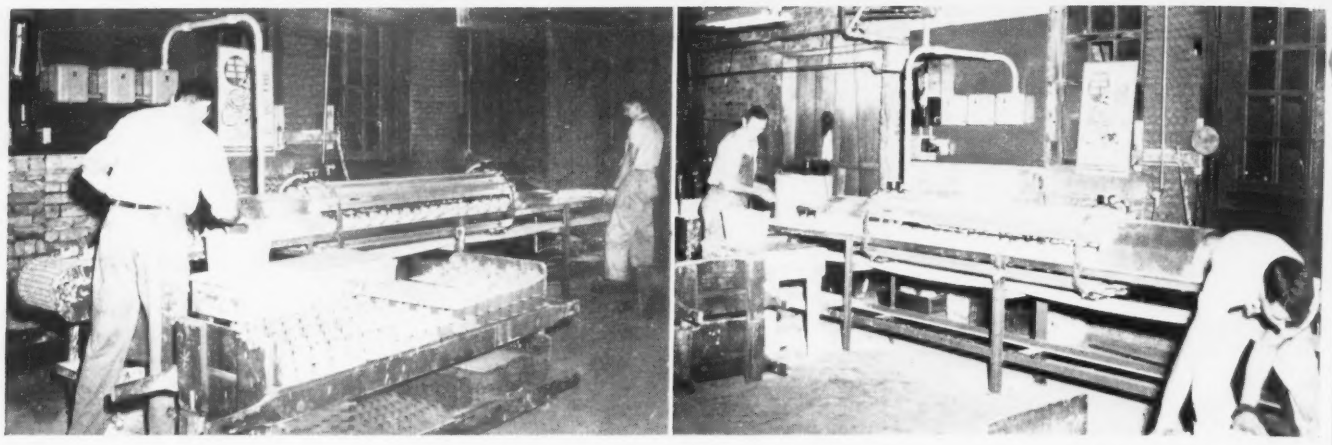
* * *

Damage estimated at $500,000 was done to Temple Foundry Inc., Telegraph Rd., Alexandria, Va., Apr. 22, by a flash fire which started in a



MICHIGAN CHEMICAL PLANT: The $12 million Hooker Electrochemical Co. plant shown here in an artist's conception now is under construction at Montague, Mich., and is scheduled for completion by the end of the year. In the area where drilling derricks are shown (top right), 200 acres of the 500-acre site have been set aside as a salt brine field. Electrolytic cells will be used to convert the brine into caustic soda, chlorine and hydrogen

Drying of Core Wash Speeded by Infrared Heating Unit



Cores are dipped at left and placed on screen type conveyor belt, which carries them through the electrically heated oven at a rate of 600 to 800 cores per hour. Equipment replaces air drying practice

APPLICATION of electric infrared heating equipment for drying the wash on dipped cores enabled the Atlas Foundry Co., Marion, Ind., to reduce its floor space requirements for this operation from approximately 6000 sq ft to 200 sq ft and at the same time eliminated a production bottleneck.

Former practice at this foundry was to permit the dipped cores to air dry on racks, a process which usually required about 24 hours and tied up a large floor area. Existing ovens were taxed to capacity in baking the cores and were not available for drying purposes.

It was decided to install a continuous oven employing Chromalox Type RAD radiant heaters. Selection of the proper heater was dependent upon a number of factors—shape, color and dimensions of the cores, desired operating temperature, production rate, type of oven construction and ambient temperature. Equipment purchased included 11 radiant heaters with the necessary input controller and magnetic contactors, and a 15-ft variable speed, screen-type conveyor system. The conveyor belt speed can be varied up to 10 feet per minute.

Plant maintenance men assembled the oven. Seven of the heating units form the top section and four are on the under side of the conveyor belt. In the accompanying illustrations one heater has been removed from the side of the oven to show how the cores pass through the tunnel. Aluminum strips are used to enclose the space between units at the sides of the conveyor, and heat baffles at each end of the heater section minimize heat loss.

The oven is located at one side of the coreroom, with the discharge end close to a doorway through which cores are carried into the molding department. Capacity of the oven is 600 to 800 cores per hour, depending on size and weight. In addition to increased production, surface appearance of the cores has been greatly improved. In air drying the wash tended to run to the lowest part of the core before it would dry. Infrared drying leaves the cores smooth and bubble-free, and reject cores are nearly nonexistent.

shed. The blaze caved in a 100 x 100-ft roof, burned the interior of the foundry and caused heavy damage to equipment. President George Simms called the building "a total loss."

* * *

Pangborn Corp. has completed a new $300,000 manufacturing building at its Hagerstown, Md., plant. The 65 x 205-ft structure was designed for the production of new taller, automatic blast cleaning equipment.

* * *

Saturn Foundry Co., 35-47 19th St., Wheeling, W. Va., is building a new plant at Nineteenth and Eoff Sts., Wheeling, at a cost of $60,000.

* * *

Allis-Chalmers Mfg. Co., General Machinery Division, Milwaukee 1, has opened a Des Moines, Iowa, branch of its Davenport district office. Under management of Edward A. Rensch, the new office is located in the Savings & Loan Bldg., 206 Sixth Ave., Des Moines. Davenport office continues under management of Albert W. Kremser who has been in charge there since 1945.

* * *

Buda Co., Harvey, Ill., has just completed new plant facilities which will enable it to double production of its line of fork-lift trucks, introduced less than two years ago.

* * *

Bison Castings Inc., 575 Howard St., Buffalo 6, has suspended operations, and plant and equipment probably will be sold soon.

* * *

Dixie Products Inc. is the new firm name adopted as of Jan. 1 by the former Dixie Foundry Co., King Edward Ave., Cleveland, Tenn.

Directory Illustrates 756 Safety Posters in Color

Miniature illustrations of 756 two, three and four-color occupational safety posters are available from the National Safety Council in the 72 pages of its "1953 Directory of Occupational Safety Posters."

These posters employ both serious and humorous approaches to help industrial safety directors accomplish their objectives. Many are for specific industries, such as the chemical, mining, petroleum, textile and others, but a wide selection involves general themes applicable to virtually all industrial fields.

For a free sample copy of the directory and a price schedule of posters, write to the National Safety Council, 425 North Michigan Ave., Chicago 11.

WHICH ELECTRODE will give you higher tonnage? . . . You're absolutely right: you can't tell by looking. We can't either—and we've been making electrodes for more than half a century. Fact is, when it comes to electrodes there's only one way to be sure: *test them on the job.* And with every new-type IGE Electrode that's just what we do. First, of course, we build into it all the properties we know it should have—controlled density, uniform structure, high purity and mechanical strength, low electrical resistance. *But* — before we put it into production we first put it into actual electric-furnace operation. We test it, we study it, we learn everything there is to know about its behavior. That way, we're never tempted to guess. We know that the high-tonnage electrodes are IGE Electrodes. And so do our many customers.

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Adventures of Bill

By PAT DWYER
Illustration by RICHEY

BILL and I blew into Chicago early Monday morning after a more or less fairly comfortable night's run on a sleeper. Quite a contrast, Bill remarked reminiscently, to the manner in which he had arrived on his first visit many years ago.

On that occasion the journey had consumed the better part of two days owing to the activities of certain uniformed gents who insisted he should change cars at several places en route. They even went further. Each time he was pushed or dragged off the brake rods with a club he was invited in the most persuasive terms to remain for an indefinite period as a guest of the town.

Refusing these kind invitations grieved him sorely, but as he explained to his would-be hosts—usually quite hurriedly—Chicago was his ultimate destination and he had to be on his way. These hospitable citizens were so insistent that sometimes he had to run half a mile or more at top speed before he could convince them that he was in earnest. He appreciated their mistaken kindness, but it interfered sadly with his schedule. Each time he crept on the rods, the roof or the end of a blind baggage, he reflected bitterly there should be a law or something to protect innocent interstate passengers from incessant and unnecessary forms of interruption. A fine free country indeed. Bah!

Shortly after we arrived at the hotel Bill discovered a group of old cronies. I only had a fleeting glimpse of him now and again until the night of the annual convention banquet. We sat at the same table with several other sociable lads in good trim. They are staid, respectable citizens in their own home towns, but for the time being they conveniently shed all restraint and talked and laughed with all the careless abandon of a bunch of boys down by the old swimming hole. Accidental reference to the old swimming hole reminded Bill of a certain youthful adventure.

Over one week-end followed by a Monday holiday, a fellow apprentice invited Bill to accompany him to his parents' home near the mouth of a noble river where it flowed into the harbor. The primary object of the journey was to shoot wild geese lingering along the coast for a short period in the spring while on their way to the far northern breeding grounds. The birds must have heard the hunters were coming, for that or some other goosey reason they made a detour. The boys never saw a feather. However, as Bill pointed out, that is beside the point and has nothing to do with the incident that made him feel sillier than any goose, wild or tame.

"This," he explained, "was my first excursion over night away from home. As I only found it necessary to indulge in a modest shave once a week in those days, I saw no necessity for cumbering myself with a traveling bag. Long and earnestly I debated with myself whether I should take my nightshirt. On the one hand I heard the ribald jeers of my companions if they once suspected the contents of the package under my arm. On the other hand I dreaded still more the secret comment of my host and hostess when they learned that their son's guest slept at night without the protection of this intimate garment. Like an alternating current, hot waves flowed from my toes to my ears as in imagination I heard the family circle dissecting me after my departure.

"If I had been sure of a private sleeping room I would have taken a chance without the thing and trusted to Providence. However, I was afraid I would be paired off for the night with the son and then my shame would be exposed to the world. Finally, I decided to stuff the garment in the inside pocket of my overcoat and then be guided by circumstances whether I should or should not wear it.

"Did any of you fellas every try to stuff a flannellete nightshirt into a coat pocket? I'm here to tell you it can't be done. I wrestled with the job for over an hour. At one time I was tempted to put it on and then

(*Continued on page* 252)

He inherited stance and skill from Tipperary stone throwing ancestors

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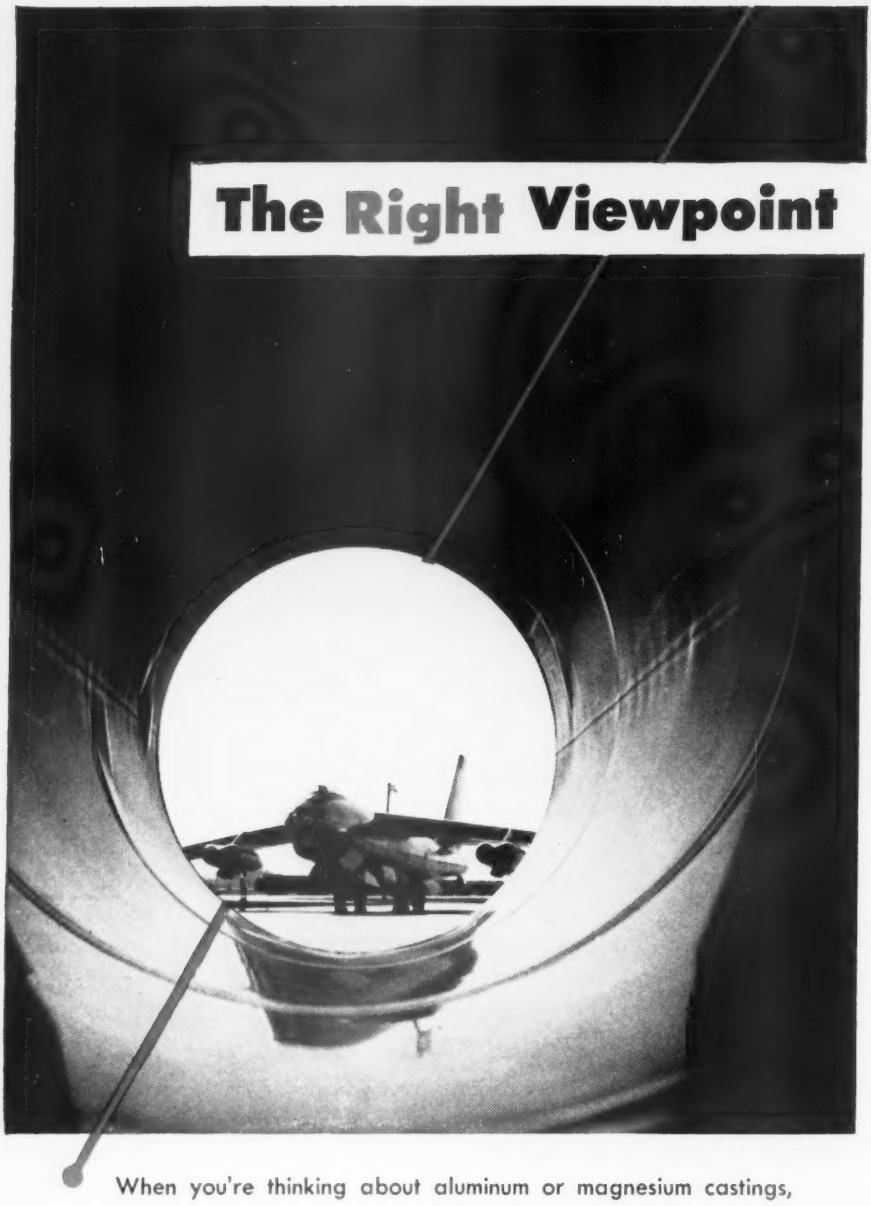
(*Continued from page* 250)

the remainder of my clothing over it. A little calm reflection shot that idea all to pieces. It was too long and if I rolled it up I should look like Santa Claus. Also the hot and cold flashes warned me of what would happen if my friend viewed me disrobing down to the nightshirt.

"After a long and valiant struggle in which I tore the pocket, I managed to wedge most of the garment inside. I had to let the sleeves dangle. After I put on the coat I bore a striking resemblance to an absent-minded camel whose hump had slipped around in front and slightly to one side.

"I removed the coat and held it on my lap immediately after we entered the house and thus temporarily escaped detection. I manfully resisted the well meant offers of my hostess to take the coat and hang it up. I hung on to it desperately like a dog with a bone and at the same time burned up inwardly at the realization that the assembled members of the family were secretly appraising me as a rare form of bug. My condition was not improved by the presence of a beautiful daughter about 18 for whose favor I gladly would have sacrificed 40 overcoats. Her occasional giggles and shyly veiled glances earned a discreet maternal frown, but they were so many points of flame to my naked and tortured soul.

"Bitterly I reflected that upon entering the house I should have made an excuse to dash upstairs. There I could have hung the coat on a hook, face in, and my guilty secret would have been safe from prying eyes until bed time. The longer I remained in the parlor the more difficult I found it to hatch up any reasonable excuse for retiring. I sat there, glued to the chair, trying to look pleasant and afraid to move lest one of the dangling sleeves coyly should peep into view. Finally, when I was on the point of collapse the lady of the house retired to the kitchen to look after the evening meal. I suggested to the son that I should like to go upstairs to kind of touch up the old map and otherwise make myself presentable. In his good-hearted clumsy way he assured me I was all right as I was. The family did not observe any ceremony, but I insisted. I hugged the misbegotten coat closer than a brother. No man suddenly snatched from the hangman experienced more relief than I did after I had hung the garments in a closet.



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We're referring, of course, to the right viewpoint toward the best possible use of these two light metals . . . ability to do the job; . . . service; . . . adequate facilities for production; . . . experience.

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THE WELLMAN BRONZE & ALUMINUM CO.

DEPT. 7, 12800 SHAKER BLVD., CLEVELAND 20, OHIO

"When the time came for retiring I found myself in a worse predicament than ever. Just as I had feared, I was paired off with the lad for a bedfellow. I discreetly hung back while he was undressing so that I might see which way the cat was going to jump. The lad was a swift actor. He stripped off all his clothing with the exception of a wooly undershirt, threw them all over the floor and then with a yell like that of a wild Indian he made a flying leap into the bed, curled up and pulled the bed clothes over his head.

"Obviously, if he was accustomed to sleeping in that primitive manner I could not outrage all the laws of hospitality by any such high hat procedure as donning a nightshirt. I shuddered in agony in anticipation of the story he gleefully would circulate in the shop on our return. I more than half suspected that none of the other members of the shop crew ever indulged in such an effeminate garment. With the perverted sense of humor which characterizes these hardy birds, I realized how they would seize upon the incident to keep me in perpetual purgatory. In mortified imagination I could hear the sly jests, the innuendos, the coarse jokes and allusions to little Willie and his little nightshirt. Life would not be worth living. I also stripped down to the undershirt and crept into bed.

"At breakfast the following morning we had fresh herring. I never had eaten one of these loathsome creatures. I always had disliked their appearance and I could not endure their perfume. I had been brought up in a fairly free and easy household and therefore, unfortunately, never had been forced to eat things I did not like merely because they are good for you my dear.' Here it was a case of acting the hero even if I died for it, or of attracting further unwelcome attention. Heaven knows I already felt sufficiently conspicuous. I managed to snaggle through a pair in the manner of a bewildered sheep struggling through a patch of raspberry bushes. 'Twas a tough ordeal, but I emerged alive. For weeks afterward whenever I felt a slight itching of the skin on any part of my body I expected to find one of the 2,000,000 herring bones working its way through."

"Never mind about the herrings," I said, "finish the tale of the shirt."

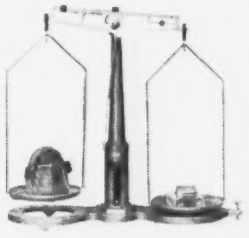
"Desperate diseases you know," Bill said, "and all that kind of thing. I hastened down to the dock in advance of the others, snatched the cause of my agony out of the pocket, wrapped a big cobble stone in the center, tied the two arms around it in a double bowline hitch and then viciously threw—not dropped, mind you—but threw it into about 7 fathoms of water. I hoped some large fish would swallow it and die in great agony."

At this point the man sitting opposite me at the table grabbed the conversational ball and started on a run down the field.

"Association of ideas or something," he said, "based partly on Bill's story and partly on a paper presented at one of the sessions today, prompts me to mention some correspondence I had recently. A western foundryman wrote me that he was planning to build and set up a small cupola about 20 in. inside. He wanted some information on the following items: Thickness of refractory lining; sand bed thickness; height of tuyeres above bed; number and size of tuyeres; height of coke bed above tuyeres; amount and size of iron in the charge; amount of coke per

(*Concluded on page* 255)

For breathing protection against Dusts in FOUNDRY operations



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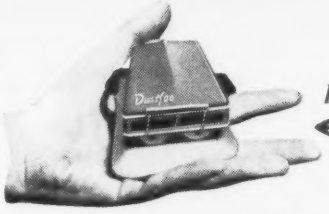

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Add 'em up and you have the reason for the Dustfoe's growing reputation as "The Respirator Workers Will Wear!"

And comfort's only half the story. The M.S.A. Dustfoe #55 is U.S. Bureau of Mines Approved for breathing protection where dusts are not significantly more toxic than lead. This effective filtering action keeps workers safe, lowers accident frequency, boosts production ability.

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This policy of complete quality control — of single manufacturing responsibility — better service — made P&H the leading builder of overhead traveling cranes. Continuous improvement, far ahead of the field, has extended this leadership. Benefit by it when you buy your next cranes.

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P&H MAGNETORQUE*
AC Crane Control
is the most important development in crane service in 25 years.

the P&H Line

(*Concluded from page 253*)

charge; position and size of slag hole; any other pertinent comment.

"I wrote him that long and short descriptions covering the construction and operation of small cupolas have been presented frequently in FOUNDRY. Iron can be and has been melted in any kind of a container provided with a refractory lining and with one or more openings through which air is admitted in sufficient volume to promote high combustion of the fuel. Taking up the specific questions in the order of their presentation, the following brief comment may serve your immediate purpose:

1—Lining, single wall of arch brick set on end with wide face next the shell or a monolithic lining may be rammed around a wood form.

2—Bed sand may be rammed to a depth of 4 in. at the back, slanted or tapered to a thickness of 3 in. at the tap hole. Permeability, moisture content and density of the sand bed are similar to those in green sand molds.

3—Tuyere height may vary from 6 to 10 in., depending on the amount of iron required at each tap. With tuyeres 6 in. above the sand bed, the cupola will hold approximately 250 lb. With 10 in. between bed and tuyeres the well will hold about 400 lb. Size and distribution of the tuyeres may vary to a considerable extent. A suggested arrangement is six tuyeres 3 x 6 in.

4—Height of bed coke, 30 in. above tuyeres after settling.

5—Iron charge, 200 lb broken fairly small.

6—Coke charge, 30 lb approximately 3 in. in cross section.

7—Slag hole not necessary on heat less than 1 hour. On long heats 2 in. below and between two tuyeres at back of cupola.

8—Blast, 500 cfm at 6 oz. pressure.

"If I had the time," Bill said, "I should like to say a word about this here now habit of rushing into a thing without proper knowledge or preparation. However, I see the chairman is getting ready to introduce the unfortunate speakers of the evening. Whenever I attend one of these affairs I am reminded of the story of the two lads standing in front of a picture of Daniel in the lion's den. One said 'How do you account for the peaceful and happy expression on the guy's face?' 'Well' the other guy comes back, 'why not? He knows there ain't going to be no after-dinner speeches!' "

Issues Company History

Norton Co., Worcester, Mass., has published a history of the company entitled *The Norton Story*. Containing 112 photographs, 324 pages and an appendix listing the names of active, retired and deceased 25-year employees. The book places emphasis on people rather than on technical descriptions, financial statements, graphs and charts. It was authored by Mildred McClary Tymeson, experienced writer and wife of a Norton employee.

Book Review

Patternmaker's Manual; fabricoid; 279 pages 6 x 9 in., 197 illustrations; published by the American Foundrymen's Society, 616 South Michigan Ave., Chicago; $4.50 to members, $6.75 to nonmembers.

Uniform in size, shape and binding with other notable books prepared and issued by the American Foundrymen's Society, this new manual in a highly satisfactory manner meets the demand of many men associated with the foundry industry. Sufficient and authentic material is presented to serve not only as a tool for in-service training of the apprentice, but also a source of reference for the trained mechanic.

Typical pattern problems are presented to illustrate basic principles applicable to practically all types of patterns. Rules, tables and data have been assembled in answer to the many requests for a comprehensive compilation of information so necessary and vital to the apprentice and journeyman. They are as brief and concise as practicable.

Comprehensive scope of the work is indicated by the following chapter headings: Safety in the pattern shop; selection of pattern lumber; patternmaking equipment; patternmaking and foundry terminology; pattern layout aids; pattern allowance; pattern coatings; descriptive elementary projects; large wood pattern construction; tooth gearing patterns; the marine propeller; production pattern equipment; phenolic resin plastic patterns; plaster patterns; coreblowing equipment; supplementary pattern materials; manufacture of engineered castings. The final chapter, general information covers cast metals, symbols and uses; specific gravities; decimal equivalents, circles and spheres; temperature conversion. Ready reference to any and all items is furnished by a seven-page index.

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A P&H ZIP-LIFT AT THIS NEW LOW PRICE

ONLY $199.50

1-ton capacity

A real wire rope hoist!

Of course you prefer the Zip-Lift! With all its quality features, who wouldn't! But if higher cost has stopped you, here's good news. It is now available with improved rope control (one pendant, *not two*), for simple, easy, trouble-free operation — for only $199.50. It is the same Zip-Lift in other respects — same quality — new type control. *What a buy!*

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Or write us for Bulletin H-29

Available also with full electric push-button control.

Other models up to 15-tons capacity

P&H ELECTRIC HOIST DIVISION
HARNISCHFEGER CORPORATION
Milwaukee 46, Wis.

New EQUIPMENT an

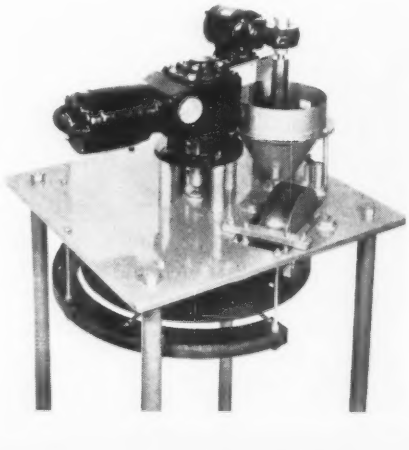
Drying Machine: Barber-Greene Co., Aurora, Ill.—Portable, rotary drum dryer for sand and other aggregates has capacity of 8 tons per hour. A rotating drum of heavy gage metal is charged by a power-operated skip with a capacity of 3 cu ft. Since the skip's upper edge is only 14 in. above ground level in receiving position, it can be charged with a wheelbarrow as well as by shoveling from a truck or from stockpiles. In the drying drum, the material is lifted by a series of metal flights attached to the drum's interior. This action drops the material repeatedly through a blast of hot gas and flame provided by an oil burner. A fuel tank with sufficient capacity for several hours of operation is mounted on the machine's frame. The dryer is said to reduce frozen, lumpy aggregates to a dried, heated and easily workable state. Mounted on a rubber-tired chassis, it can be towed by a light pickup truck. Power source is an air-cooled gasoline engine.

For More Details Circle No. 1—Page 259

X-ray Machine: Picker X-Ray Corp., 25 South Broadway, White Plains, N. Y.—Device produces a positive x-ray print in 1 minute, using the same principle in radiography that has been used in the Polaroid Land camera. The cassette can be loaded in broad daylight if necessary. Exposure is made with any x-ray source; then the cassette is slipped into the processing box. No darkroom, liquid processing solutions or preparing process chemicals are needed. After one minute, the finished, completely dry radiograph can be taken out and used in any fashion required.

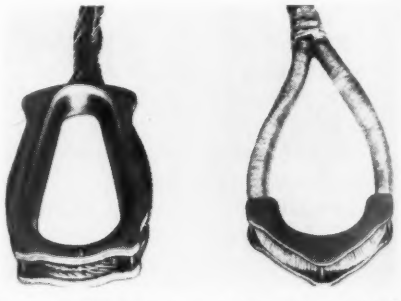
For More Details Circle No. 2—Page 259

Moisture Determiner: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4 — Continuous electrical moisture determination machine takes a flowing sample of core or molding sand from a conveyor or mill. Sand is riddled and falls on a rubber-faced rotating disk, is struck off to a constant volume and rammed by a roller to a predetermined hardness. High-voltage current flows through the ribbon of sand, flowing farther in high moisture content sand. Moisture content thus is expressed in distance over a well expanded scale. A simple electrical circuit controls the rate of water flow into a sand mill, either batch or continuous, to a predetermined moisture content. The unit also can be used to dump a measured quantity of water into a mill. Placed ahead of the mill, it determines moisture of incoming sand and dispenses water required to temper the batch. Whenever hot sand is prepared, another of the company's machines can be used in conjunction with this one to measure out the necessary evaporation loss. The unit also can be used to record continuously the moisture content of sand leaving a mill or on a conveyor.



For More Details Circle No. 3—Page 259

Wire Rope Sling: A. Leschen & Sons Rope Co., 5909 Kennerly Ave., St. Louis 12—Reusable thimble fittings attached to eight-part braided sling by pins are readily removable for reuse. They are said to effect considerable savings for sling users since the fittings often outlast the slings. Such savings are said to amount to 20 per cent or more. Manufacturer reports that savings amount to 23.6 per cent on a 10-ft sling made of ½-in. wire rope and to 8.5 per cent on a 10-ft sling made of 3/32-in. wire rope.



For More Details Circle No. 4—Page 259

Barrel Cleaner: Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Airless blast barrel cleaner now is available in 3 and 18 cu ft capacities in addition to the 6 and 12 cu ft models previously available. The new

SUPPLIES

For More Details on these Items Use Reply Card—Page 259

sizes have all the construction features of the first ones. These include abrasive-tight doors; a heavy rubber curtain between the door and area in which the blasting takes place and a work conveyor drive with automatic torque throwout arm protection. Power for the work conveyor drive is supplied from a separate motor through V-belts to a spur type reducer mounted directly on the work conveyor top shaft. Antifriction roller bearings have been applied at all points where shafts carry loads. Non-pinch work conveyor consists of a continuous, hardened steel roller chain with heavy metal slats designed so that no opening is ever presented to pinch the work or clog. Individual, perforated slats are easily replaced as they wear, and the entire assembly can be removed from the machine. Drum ends turn freely on roller bearings packed with grease and sealed. A quick-acting work loader, with double cables for safety, delivers the entire load into the machine, with the least possible drop, reducing casting breakage.

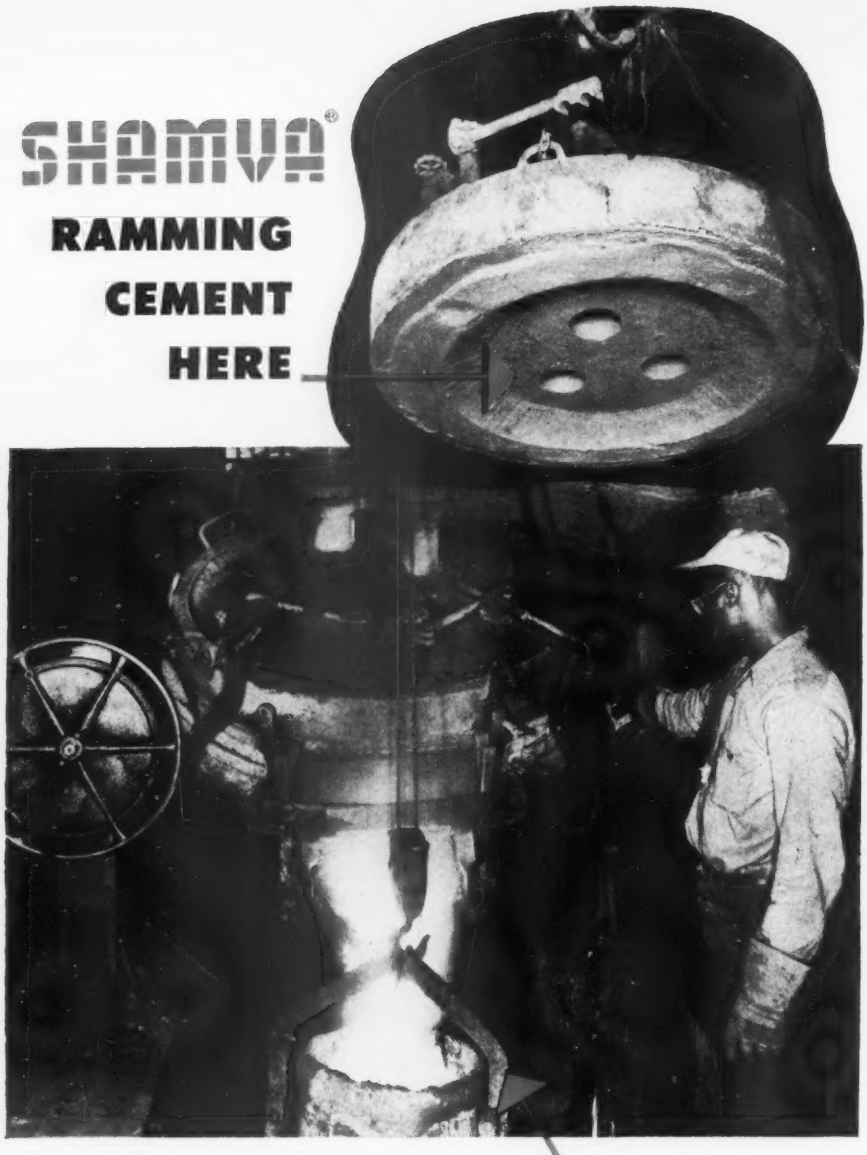
For More Details Circle No. 5—Page 259

Magnetic Brakes: Dings Brakes Inc., 4740 West Electric Ave., Milwaukee—Fractional horsepower magnetic brakes for all standard alternating or direct current motors are available with torque ratings of 1½, 3 and 5 lb ft, and with thermal ratings of 6, 7 and 8 hp seconds per minute, respectively. They self-adjust for wear, but critical adjustment of torque can be made for precisely timed stops. Molded asbestos friction disks have high heat dissipation. Design eliminates solenoids and linkages. All brakes are equipped with hand releases and mount without dismantling. Motor and brakes are connected in parallel. When the motor starts, an energized magnet operates to release pressure on the rotating friction disks. Stopping the motor de-

Angle Grinder Eliminates Need for Gears

AIR-POWERED, direct drive angle grinder eliminates the need for gears. Speed is 6000 rpm at 90 psi air pressure. The grinder is available with a straight handle or with one 30 degrees off straight, both attachable to either side of the grinder. The angle dead handle can be rotated to any one of four positions, facilitating adaptation of the tool for corner grinding or for right or lefthanded operators. A built-in lubricator provides ample lubrication for long, trouble-free service. Motor is muffled, and the exhaust deflector is adjustable. Heavy-duty, ball bearing construction throughout reduces friction. Throttle is quick acting. Unit is said to have power to provide fast, safe and efficient operation on almost any surface grinding, cutoff or sanding job. It is made by Ingersoll-Rand, 11 Broadway, New York 4.

For More Details Circle No. 6—Page 259



PAYS OFF FOR
FERRO MACHINE HERE

Ferro Machine & Foundry Inc., Cleveland, Ohio, one of the largest independent gray iron foundries in the U.S., has been in business over 40 years. Their specialty is automotive type castings. To keep production up, Ferro puts 38 tons of high strength alloy iron through a "Q" Lectromelt in 16 hours. At 2900° this pace has been death on furnace roofs. Using special shape silica roofs, Ferro was getting a service life of 4 weeks per roof. After switching to Shamva 65G ramming cement, Ferro now reports an increase of roof life to 7 weeks.

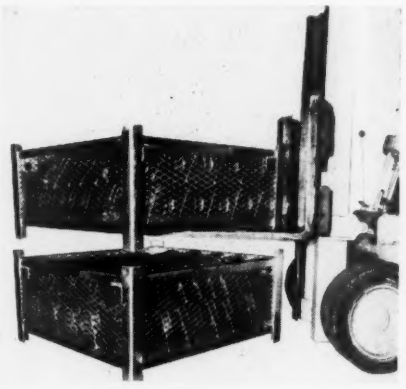
Shamva cements, as well as Shamva brick and shapes, can do a job for you, too. Why not see what Shamva can do for your production curve. Our field engineers will be glad to discuss it with you.

THE MULLITE REFRACTORIES CO.
SHELTON, CONN.
In Canada, Shamva Products Co., Ltd., Niagara Falls, Ontario.

energizes the magnet and frees the pressure plate, which applies firm pressure to the friction disks, thus stopping the motor instantly and holding the load.

For More Details Circle No. 7—Page 259

Steel Box: Morrison Steel Products Inc., 601 Amherst St., Buffalo 7—All-steel, stacking-type materials handling boxes can be stacked as high as space and materials handling equipment permit. Constructed of heavy, formed steel frames with sides and bottoms of sheets of 9-gage, unflattened, expanded steel, they are 50 in. square at the top, 49 in. at the bottom, and 24 in. high,



overall. Each will accommodate up to 7000 lb, according to the manufacturer. Four equally spaced, ¼ x 2-in. steel reinforcement bands are welded across the bottom for maximum strength and overall rigidity. Heavy hook plates at the corners provide for lifting with a crane.

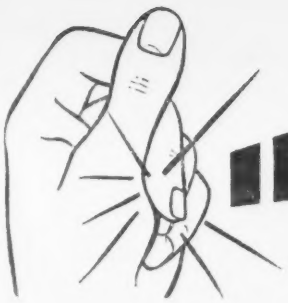
For More Details Circle No. 8—Page 259

Electrode Holder: Jackson Products, Warren, Mich.—Electrode holder rated at 250 amp takes electrodes 1/16 through 7/32-in. Cables not larger than 1/0 can be soldered or brazed, and cables through No. 1 can be clamped in place. Constructed of heat treated, 98 per cent copper alloy for strength, hardness and conductivity, it weighs 19 oz. Jaw insulators are of a thermosetting plastic.

For More Details Circle No. 9—Page 259

Fog Nozzles: Bete Fog Nozzle Inc., 85 Pierce St., Greenfield, Mass.—Fog nozzles with spiral fog tips are said to achieve high capacity, coverage and breakup. A special, narrow-angle fog tip provides extra-long reach with excellent atomization. Turning the handle changes nozzle from "off" to "fog" and then to "straight stream." One model has a fog capacity of 50 gpm and a straight stream capacity of 100 gpm. It is recommended whenever maxi-

(*Continued on page* 261)



IDEAS FOR FOUNDRYMEN

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

66. Oil Level Control Unit

Drying Systems, Inc.—Here's an 8-page illustrated bulletin (No. C-9) that describes Dry-Sys oil level control units for pumping, preheating and circulating oil on industrial oil burner systems. Construction details are given, as are operating data. This one is *oil* right.

67. Not Stopped by Fire!

Pettibone Mulliken Corp., Beardsley & Piper Div.—"A Half-Million Dollar Fire Couldn't Stop this Foundry!" is intriguing title of an article in a recent issue of "Better Methods." We know you are not anticipating such an event, but we know you will get some valuable bits of information from reading it. Told by its v.p. and gen'l mgr.

68. Steel Belt Conveyor

Prab Conveyors, Inc.—Drawings, engineering data and photographs of steel belt conveyors are found in catalog identified as No. 250. Features of the steel belt and Chip-A-Way conveyor using it for chip and scrap removal from machine tools and presses are covered. You'll get a real "belt" out of this one.

69. Crane End Trucks

Industrial Equipment Co.—Dimensional drawings, specs, design features and other details of line of packaged crane end trucks are to be found in 8-page illustrated bulletin T-1152. Capacity table shows units with spans of 6 to 45 ft capable of supporting 500 to 16,000 lb. There's a type for every application.

70. Grinding Wheels

Cleveland Quarries Co., Sterling Grinding Wheel Div.—"Specifications for Cut Off and Snagging Operations, Stand, Swing, Frame and Portable" is title and subject of 4-page illustrated data sheet. Recommendations are made according to type of material to be cut, speed, equipment type and wheel type.

71. Core Paste

Whitehead Brothers Co. — Lyquagrip is a ready to use core paste that is described in 4-page folder. Product is odorless, noncorrosive, fast drying, moisture resistant and able to withstand all oven temperatures.

72. Metallurgical Lab Presses

Buehler Ltd.—If you're looking for a press for your met lab, you should at least send for this 8-page illustrated bulletin. It describes in detail a specimen mount press, universal press, speed press and various press accessories. Complete specs and prices are given.

73. Ball Bearing Trolleys

Richards-Wilcox Mfg. Co.—Detailed descriptive and dimensional information on R-W ball bearing trolleys is featured in 4-page form F-171. A steel plate model is also specified. Trolleys feature short wheel base for easy operation on curves.

74. Chisel Grinder

W. M. Steele Co.—Making the chips fly through speedy and accurate sharpening of metal chipping chisels, suiting cutting angle to the work, is easy if you use model 10 grinder described in 2-page illustrated catalog sheet. Tool will produce any cutting angle between 30 and 75 degrees in any even 5-degree step.

75. Cut-Off Saws

Henry H. Wise Co.—Abrasive cut-off and cost reduction go hand in hand with the line of saws described in 4-page illustrated folder. Motors are 7½ or 10-hp, wheels 18 or 20-in. Machines will cut 6-in. pipe or 8-in. channel in six seconds. Machine data includes wheel recommendations.

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Helpful Literature" in this issue—simply circle corresponding item numbers on one of these cards

6-53

FOUNDRY
Penton Building, Cleveland 13, Ohio

Please send literature or detailed information on subjects circled at left to—

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76. Pressure Cast Aluminum

Accurate Match Plate Co.—Match plates, cope and drag plates, pattern castings, core boxes, dump, split and booked boxes, dryer patterns and other foundry items of wide use are described and illustrated in 16-page booklet "Accurate Aluminum Pressure Cast Products." Construction details and price information are given.

77. Cast Refractory

Corhart Refractories Co.—Corhart 104 Electrocast refractory is an electrically melted and cast refractory for the metallurgical industries. It is described, some of its applications illustrated and its properties shown in 12-page bulletin. Excellent photographs show test results and much technical data are given.

78. Products to Serve You

American Car & Foundry Co.—". . . and the diversified facilities of its many plants make A.C.F. an excellent source of supply for almost any type of product calling for foundry, fabrication, weldment or machine shop facilities. . . " These words preface a list (and it is a real list) of products available from this company.

79. Arc Welding Equipment

Harnischfeger Corp. — "Everything for Arc Welding" is title of 20-page pocket-size booklet which catalogs P&H alternating and direct current arc welders, welding generators, self-powered arc welders, welding positioners, production welding control systems, arc torches, welding accessories and electrodes.

80. Aluminum Casting Alloy

William F. Jobbins Inc.—Almag 35, a high purity virgin aluminum alloy that combines high strength, high ductility, high shock and corrosion resistance and high everything with dimensional and physical stability and excellent machinability is subject of descriptive 12-page brochure. Applications are discussed.

81. Melting Furnaces

Reda Pump Co.—"Clean lines, no gadgeteering and efficient hearth design," is the way 1000 series and 400-550 series melting furnaces for ferrous and nonferrous alloys are described in 4-page descriptive bulletin. Data on daily melt record, refractory performance and fuel consumption are tabulated. Furnaces are the reflecting type, and could reflect sizeable savings for you.

82. Gray Iron Casting

American Car & Foundry Co.—"Artistry in Metal" is title of 40-page brochure containing the castings story from Nineveh (850 B.C.) to neon. It takes you on a picture tour of a modern custom foundry and shows how unusual problems have been considered and solved.

83. Foundry Core Oil

Masonite Corp., Chemical Div.,—Masonex is a 55 per cent by weight aqueous solution of water soluble and dispersible wood gums and resins obtained in the controlled steam explosion of native woods. What's it used for?—as a partial replacement and extender for expensive core oils, or as a complete binder replacing both oil and cereal. Ten-page technical bulletin CD No. 2 tells the story.

84. Sand Conditioners

Royer Foundry & Machine Co.—Three models of sand conditioners for the small foundry are described in 4-page illustrated bulletin 1152. Capacities for models shown are 4 to 7, 7 to 9½ and 12 to 15 tons per hour.

85. Pumps & Compressors

Pennsylvania Pump & Compressor Co.—Twenty-one different types of pumps and compressors are outlined in 4-page folder. It gives rapid picture of a complete line of equipment, tells how to request more detailed information on any item.

IMPORTANT READING FOR FOUNDRYMEN
We have a limited quantity of the following reprints which we can furnish while they last.

86. Ford Foundry

Reprinted from FOUNDRY, a 56-page brochure gives a complete look at the Ford Motor Company's Cleveland foundry. Especially interesting is the way in which modern materials handling and flow practises are pointed up. Makes interesting reading and valuable reference material.

87. Gray Iron Casting Design

Fundamentals to be observed in design of gray iron castings are well set out in a reprint, showing how foundryman and designer can work together. It includes such data as design of joints without hotspots or weaknesses, heat-treating, stress-relieving, machine finish allowance and castings tolerances.

88. "Gating for Shell Molding"

FOUNDRY reprint gives a short and wholly practical outline of scientific gating methods for shell molding which will eliminate dirt and slag inclusions and give you a clean casting. Shows typical strainer cores and three different gating procedures.

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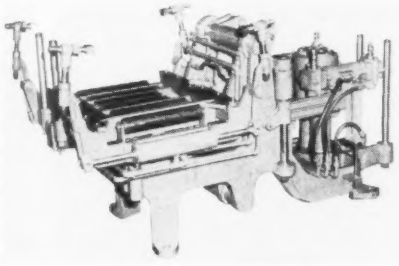
(*Continued from page* 258)

mum reach and coverage are required and water pressure and supply are adequate. A second model, for inside fire fighting where water damage must be kept at a minimum or for use on long lines when water or pump capacity is limited, has a fog capacity of 25 gpm and a straight stream capacity of 50 gpm at 100 psi. Self-cleaning and nonclogging, both models are designed for 1½-in. hose.

For More Details Circle No. 10—Page 259

Molding Machine: International Molding Machine Co., LaGrange Park, Ill.—Air rollover, air draw molding machine is designed especially for jobs that are difficult to draw.



Said to offer exceptional accuracy of draw, it features air-actuated clamps for clamping either corebox or pattern plate to machine frame, air clamps for clamping core plates or bottom boards, air-operated equalizers, air vibrators and dual control valves. This news item appeared in the May issue of FOUNDRY, but was accompanied by an illustration of the company's JJR machine, rather than by one of the GJR, shown here.

For More Details Circle No. 11—Page 259

Radial Arm Saw: Dewalt Inc., Lancaster, Pa.—New radial arm machine which replaces a previous model has an arm 1½-in. longer. The roller head carriage supporting the overhead cutting member rides on eight bearings instead of four. Four ball bearings are set at a 90-degree vertical plane to absorb the extra upward thrust from rafter notching, compound angle cutting and similar operations, and the other four are set at a 45-degree plane to absorb the side thrust created through normal sawing action. Each bearing has a surface contact 11/16 in. wide with the track on which it rides. All are preloaded, double row bearings.

For More Details Circle No. 12—Page 259

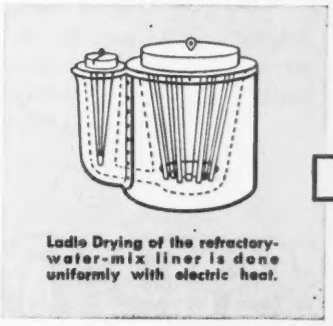
Interlocking Connectors: Rodale Mfg. Co., Emmaus, Pa. — Locking device makes possible all-rubber, interlocking, electrical connectors specifically designed for heavy industrial use. Right-angle lugs at the tips of female contacts engage and support the male blades, establishing a strain-proof, double locked connection. This feature and the all-rubber body are reported to avoid the danger of body breakage, chipping and broken connections caused by impact, pressure or vibration. The connectors are Underwriters listed and CSA approved.

For More Details Circle No. 13—Page 259

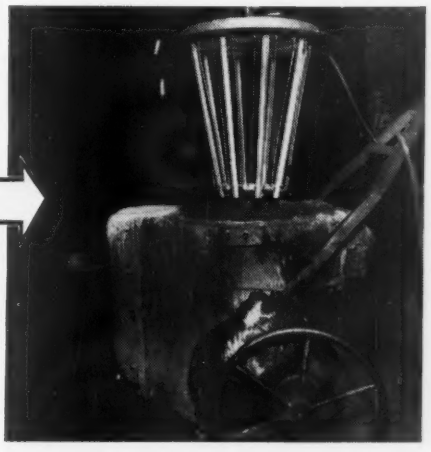
Balance: Ohaus Scale Corp., 1050 Commerce Ave., Union, N. J.—Balance features a micrometer poise that enables the balance to be used for a range of from 0.5 to 1000 grams without additional weights. Poise can be slid along the beam for rapid traverse and rotated for final positioning. Poise barrel is calibrated in 0.5-gram increments subdividing 10-gram beam divisions. Balance is equipped with 7-in. diam stainless steel plates and an etched aluminum graduated beam. Capacity is 5000 grams, sensitivity 0.5 gram. Balance has an undivided tare beam of 1-lb capacity. Self-aligning bearings are of agate, and knife edges are of hol-

Another CHROMALOX Production Tip

ELECTRIC HEAT UNIFORMLY DRIES LADLE LINERS



Ladle Drying of the refractory-water-mix liner is done uniformly with electric heat.



PROBLEM

Dry liners quickly and get ladles back into use; reduce rejects due to the uneven drying of the manually operated gasoline torch method on ladle liners; reduce the high man-hour cost of drying each of the ladle linings; make work area more comfortable.

SOLUTION

A standard, flange type Chromalox Electric Heater was mounted in a lifting lid and lowered into the ladle as heat was required. A small blower was installed to force air through ladle; another small tubular heater was installed in spout to do the same job.

ADVANTAGES

Automatic temperature controls assure even heat on all parts of the liner. Guesswork is eliminated, and exactly the right amount of heat is forced into the liner as required to dry it thoroughly. "By-product" advantages include the elimination of the hazards of open flame drying and cleaner, more comfortable working area.

CHROMALOX

Electric Heat for Modern Foundries

SEE HOW CHROMALOX ELECTRIC HEAT CAN CUT MANY FOUNDRY OPERATING COSTS.

EDWIN L. WIEGAND COMPANY SS-30
7596 Thomas Blvd., Pittsburgh 8, Pa.
Send me more details on Chromalox Electric Heat for
☐ Shell molding ☐ Core drying
☐ Skin drying of molds ☐ Comfort heating
Name
Company
Street
City Zone
State

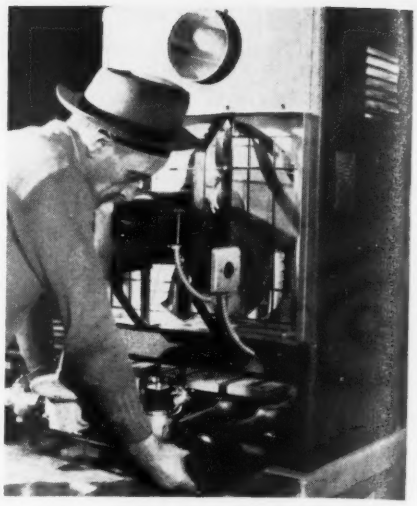
low ground tool steel. Balance beam is of lightweight, high strength Duralumin. It can be furnished with flat stainless steel plates, nickel plated brass pans or a seamless brass scoop and stainless steel weighing platform.

For More Details Circle No. 14—Page 259

Corebox Material: Martin Engineering Co., Kewanee, Ill.—Rubber insert and overlay material for use on core box inlays, blowplate facing, parting line facing and other foundry applications has specially treated abrasion-resistant and oilproof surfaces. It is available in sheets 1 ft square and 1/8, 3/16 and 1/4 in. thick. One side is a polished, high gloss working surface, and the other is sanded to make it receptive to adhesive materials. A special bonding cement is available in unbreakable polyethylene applicator bottles in 2, 4 and 8 oz sizes. Used with it, the insert and overlay material is reported to adhere at temperatures up to 300°F.

For More Details Circle No. 15—Page 259

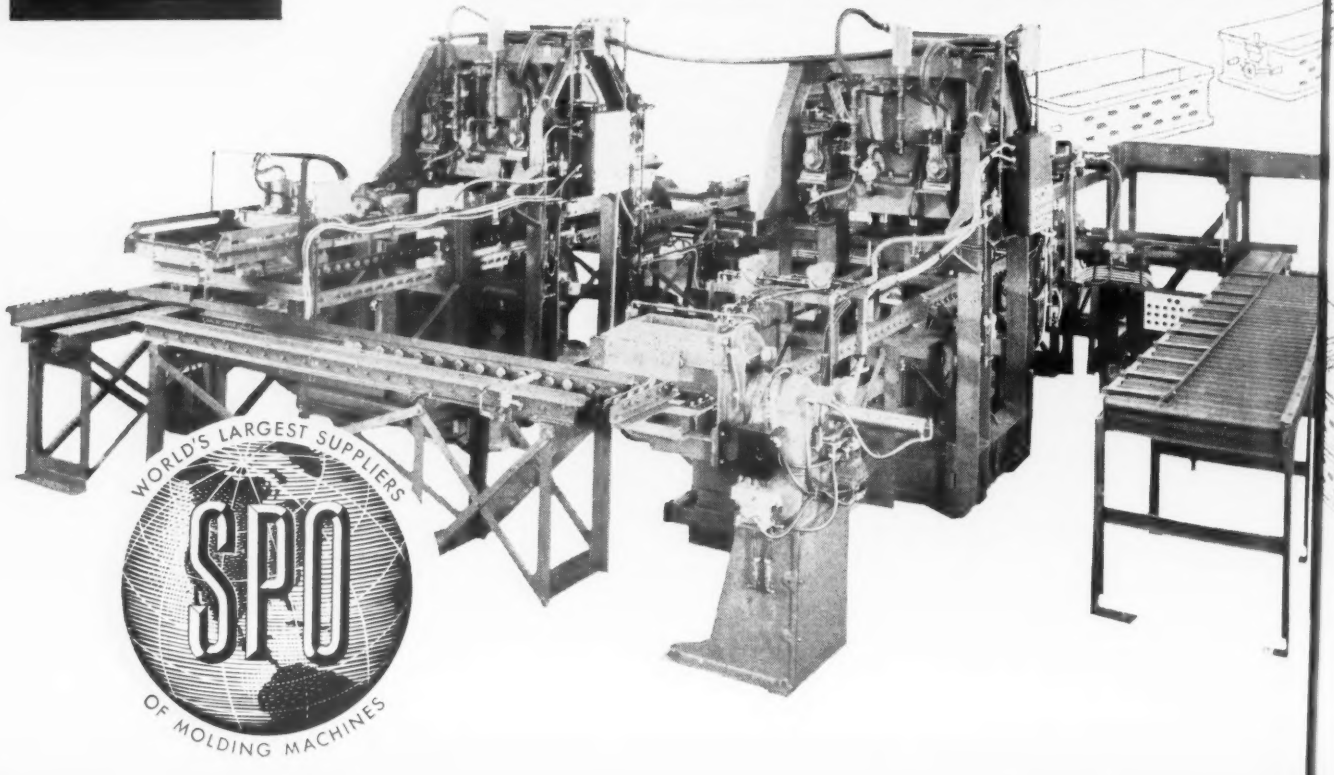
Space Heaters: Heating Dept., Machinery Division, Dravo Corp., Dravo Bldg., Fifth & Liberty Aves., Pittsburgh 22—Company has extended its line of space heaters through the addition of suspended, gas-fired units. Suitable for natural, manufactured, mixed, liquid petroleum, sewage or coke oven gas, and available with input capacities ranging from 85,000 to 215,000 Btu per hour, one model comes with a standard fan, another with a squirrel-cage blower for short runs. A model without a blower is designed as a heating unit to be built directly into air conditioning duct systems. Cast, Bunsen type burner assembly can be removed quickly for servicing and cleaning. Drawer frame slides out with the mounted burners and all controls. Like the company's other heaters, these carry American Gas Association approval and are listed by Underwriters' Laboratories.



For More Details Circle No. 16—Page 259

Variable Speed Drive: Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10—Variable speed electric drive provides stepless adjustable speeds from alternating current circuits in the lower horsepower ranges. It operates at speeds

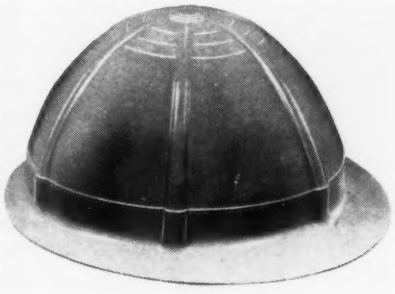
SPOMATIC



of from 270 to 2300 rpm, or from as low as 75 rpm for setting-up operations, light loads or intermittent duty. Unit is available in ¾, 1, 1½, 2 and 3-hp ratings. Operator's control station provides start and stop buttons, a selector switch and a speed adjuster. The control unit, mounted in a compact steel cabinet, requires no attention from the machine operator and can be located on a wall or column in the plant area where it is to be used, in the base of the machine or in a remote location.

For More Details Circle No. 17—Page 259

Safety Hat: Willson Products Inc., 237 Washington St., Reading, Pa.—Shell of safety hat is molded in one piece of lightweight, moisture-proof plastic and passes all required tests for impact resistance, pierce resistance and dielectric strength. One model has a "buffer" type vinyl headgear with leather sweatband and elastic chin strap. Other model has lighter type vinyl headgear and leather sweatband. Either headgear is attached to the hat by six suspension points molded into the interior of the shell so that no rivets or lacing pierce the hat. Headgear assemby can be changed quickly. Contours of the hat are designed to deflect flying or falling objects. Clearance between shell and skull provides extra safety and permits air circulation.

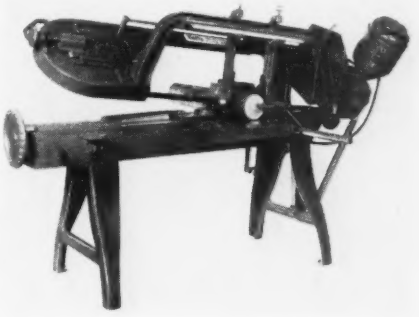


For More Details Circle No. 18—Page 259

Sand Blaster: Corson Co., Investment Bldg., Fifteenth & K Sts. NW, Washington 5—Portable sand blasting machine uses any clean, dry sand that will pass through a 16-gage screen, metal shot, flint shot, grit or such sand blast sand as Nos. 00, 0 and 1. It has no moving parts or mixing chambers and operates from any direct air line or compressor with 80 lb pressure or more. Average air consumption is 30-35 cfm, depending on nozzle size and air pressure used. Pressure is adjustable from 30 to 120 psi. The machine reportedly removes concrete, rust, scale, paint and dirt and can be used on metals, stone, wood, brick, plastic and glass surfaces. Models are available with sand capacities of 90, 150 and 200 lb.

For More Details Circle No. 19—Page 259

Band Saw: Wells Mfg Corp., 310 Service Rd., Three Rivers, Mich.—Metal-cutting horizontal band saw has been designed especially for use



with the new "Milford Rezistor" high speed steel band saw blade and has been approved by the producers of that blade. Design features include heavy duty counterbalance frame and beam; band wheels that provide for the use of 1-in. wide blades; a constant-load blade tensioning device, and a synchronized speed blade cleaning brush. The new model also

HEART OF THE Automatic Foundry

The new SPOMATIC molding machine makes the automatic foundry of the future possible today!

This high-speed mass-production machine makes accurate copes and drags simultaneously . . . sets the cores . . . closes the molds . . . and puts them on the pouring conveyor. Then, after molds have been poured and put through the cooling cycle, the SPOMATIC knocks out, cleans, and separates the flasks and feeds them into their respective ramming unit for immediate re-use.

Once a SPOMATIC is started, *all operations are fully automatic, continuous and mechanical.* Complete operating cycle is set up quickly and easily by means of pushbutton-actuated electrical controls. Master control panel utilizes only two buttons ("ON" and "STOP") and three selector switches.

SPOMATIC installations are engineered to individual foundry requirements. SPO engineers will be glad to discuss your needs and to make recommendations. Write for additional information or call DIamond 1-3666.

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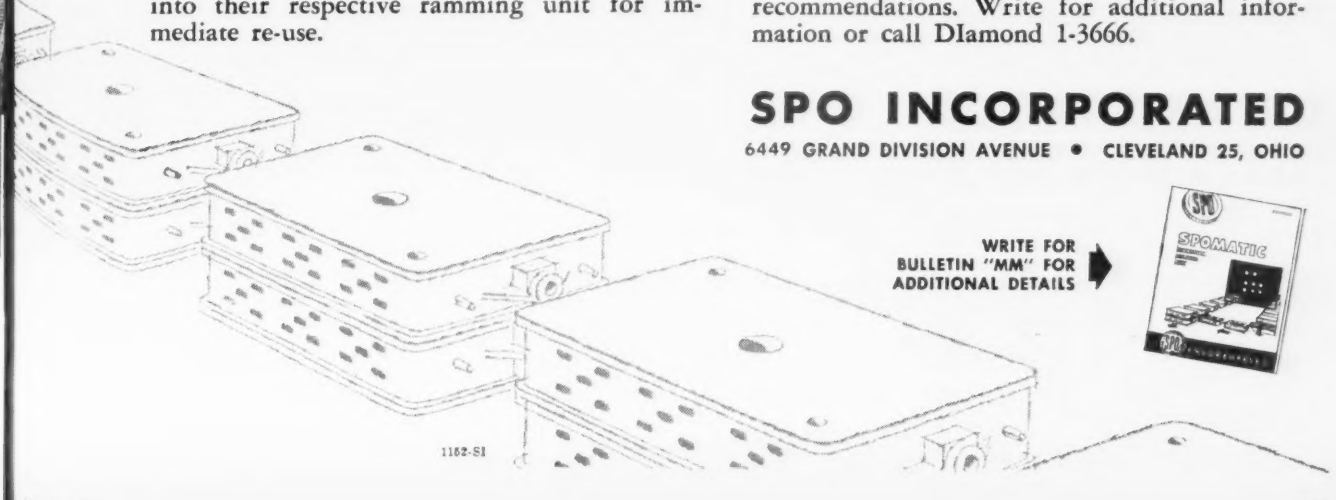


WRITE FOR BULLETIN "MM" FOR ADDITIONAL DETAILS

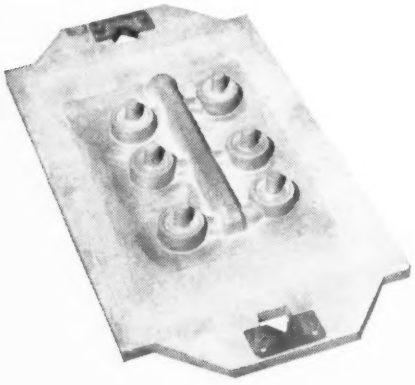
1152-S1

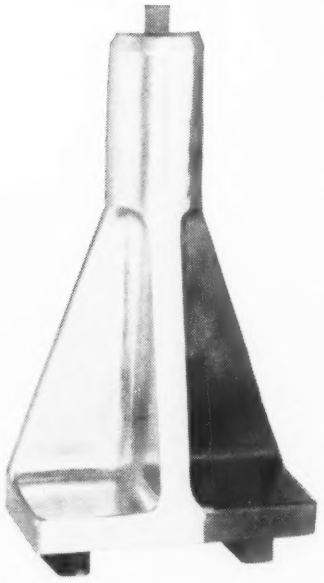
can be used effectively with standard carbon steel blades. Capacity is 8 in. in diam.

For More Details Circle No. 20—Page 259

Penthouse Fan: Chelsea Fan & Blower Co., 639 South Ave., Plainfield, N. J.—Penthouse fan is streamlined for reduction of air impact and rumble and undercoated with noise-deadening material. Overhanging front section has bypass tray that discharges back on the roof any water that passes shutters during severe rain storms. Motors are totally enclosed and explosion-proof. Insulation is available on interior wall to prevent condensation and to conserve heat. For the ventilation of buildings with ceiling temperatures of 75°F or more, automatic ceiling shutters can be installed directly below the unit to prevent heated air from condensing on cold walls of the unit when the fan is turned off. Sizes are 12 to 60 in., 5000 to 40,000 cfm. Two models are available, one of which takes a belt drive fan, the other a direct drive fan.

For More Details Circle No. 21—Page 259





Make Your WOOD and CAST STONE Patterns work like METAL With —

MABCO ALUMINUM PATTERN PAINT AND PLASTIC

And at a fraction of the cost!

The Photographs show how you can have patterns that work like metal at as little as ONE-FOURTH the cost of metal patterns. Note the Cast Stone Match Plate above (left) coated with one thin coat of MABCO PATTERN PAINT. No finishing was attempted nor was it required to put the pattern into production.

Check the following features —

- √ Quick dry, paint-on metallic Aluminum coating which may be SANDED, FILED OR MACHINED when dry.
- √ May be used to build up or revamp metal or wood patterns.
- √ Hot sand does not stick to coating.
- √ Impervious to moisture and most solvents.
- √ Is not affected by synthetic binders.

NOTE The solvent for MABCO PATTERN PAINT and MABCO ALUMINUM PLASTIC is MABCO THINNER.

Use no other solvent since the binder will not release ordinary solvents, rendering the material useless.

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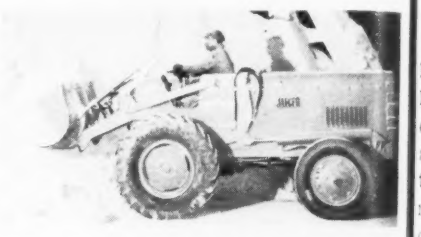
"Serving the foundry industry for over 25 years"

HOUSTON DENVER

Tractor Shovel: Jaeger Machine Co., Dublin Ave., Columbus 16, O.—Tractor shovel has static load capacity of 5000 lb, turns in 14-ft radius, hoists bucket from ground to 8 ft 2 in. dumping clearance in 9 seconds



and travels at speeds up to 18.7 mph forward and 28.2 mph in reverse. It is a 1-cu-yd unit. Torque converter eliminates shock loads on transmission, automatically applies power to meet varying loads and, in combination with five-speed transmission, provides an infinite number of gear ratios. Single lever reverses travel direction, without gear shifting. Load, centered on 13:00 x 24 front driving wheels, is counterbalanced by engine at rear. Rear axle steering is by power booster. Ground clearance is 1 ft. Engine is 55 hp, either gasoline or diesel. All loading functions are hydraulically actuated. Machine has 24-in. reach at 8 ft, 2 in. dumping clearance (10 ft, 4 in. under bucket hinge) and 34½-in. reach at 7 ft clearance. Other models available in 12 cu ft, ⅝ cu yd and 1½ cu yd sizes.

For More Details Circle No. 22—Page 259

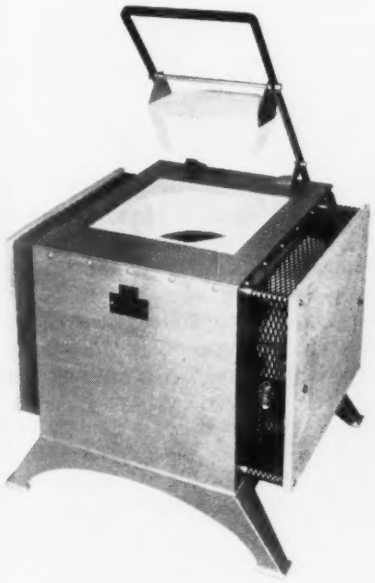
Floor Resurfacer: Rock - Tred Corp., 7442 North St. Louis Ave., Skokie, Ill.—Floor resurfacing and patching material sets by compac-

tion, not by curing. A plastic material, the product is ready for use just as it comes from the container and can be applied over cement, brick, metal and other surfaces. Once the product has been raked over a clean, primed surface, rolled to ¼-in. compacted thickness and sprinkled with surface powder to eliminate tackiness, traffic can roll

over the new installation immediately, according to the company. The resurfacer is packed in 825 lb units, including primer and surface powder. Coverage is approximately 275 sq ft, ¼-in. thick.

For More Details Circle No. 23—Page 259

Electric Furnace: Sentry Co., Foxboro, Mass.—Electric furnace for laboratory and shop melting of small crucible charges of various metals and alloys will maintain temperatures up to 2500°F. A cylindrical muffle chamber reduces the tendency of fumes from the melting operation to enter the furnace heating chamber and affect the heating element life adversely. Provision also is made for venting fumes through the door when it is closed. Heating is accomplished by four silicon carbide rod-type resistors operating directly from a 220-v supply. Accurate temperature control is maintained by automatic pyrometer control equipment.



For More Details Circle No. 24—Page 259

Magnetic Clutch: Clark Mfg. Co., 1830 East 38th St., Cleveland 14—Magnetic particle clutch using stainless steel particles consists of two independent, rotating members, a driving element and a driven element, separated by a space filled with small ferromagnetic particles (stainless steel). When one of these members is energized, usually with an electromagnetic coil, the particles polarize and bind together, binding the two rotating members with a force in direct proportion to the energy induced. Advantages are said to include smooth engagement without grab or chatter; continuous operation with negligible wear; instantaneous response, absorption of tor-

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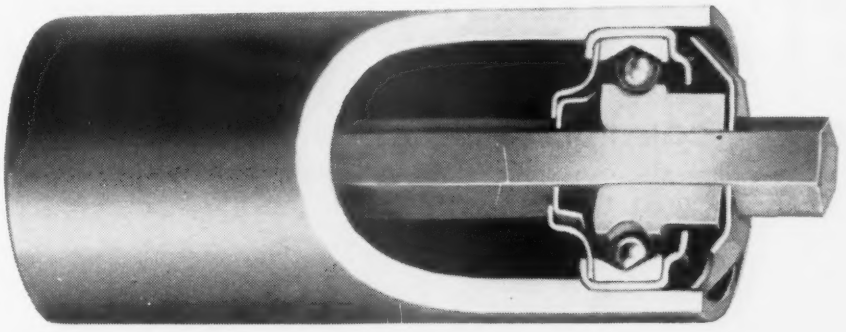
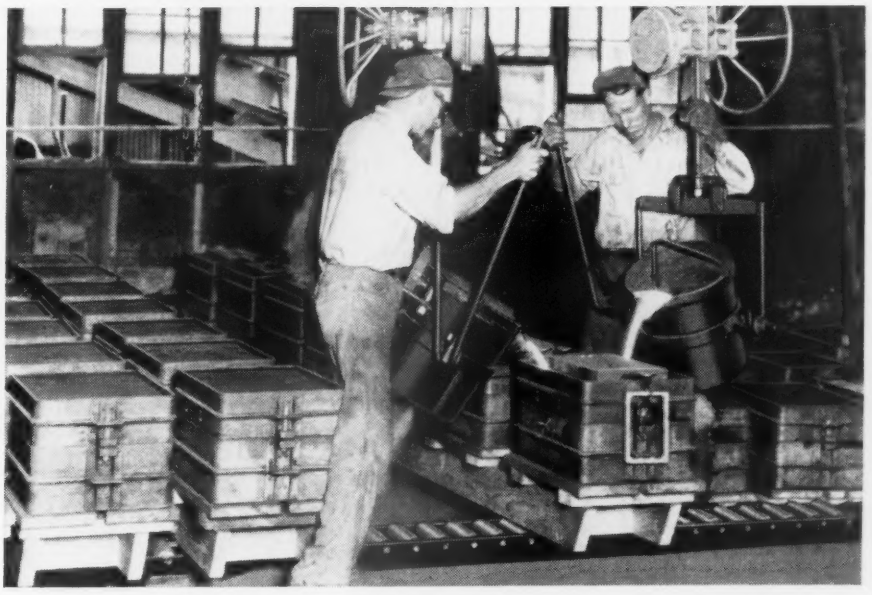
Are Expressly Designed for Foundry Conveyor Service





Every Standard roller conveyor is equipped with specially designed bearings that provide the maximum of protection and durability in foundry service. Spillage of hot iron is guarded against by special steel shields. These convex shaped shields fit into the ends of rollers to repel foreign matter. An exit for small particles is provided by an opening at bottom of shield.

Foundry conveyors are designed and built in their entirety by Standard—in a wide range of sizes, weights and types. You can depend on Standard for the right conveyor for your needs — we have been designing and building foundry conveyors since 1906.

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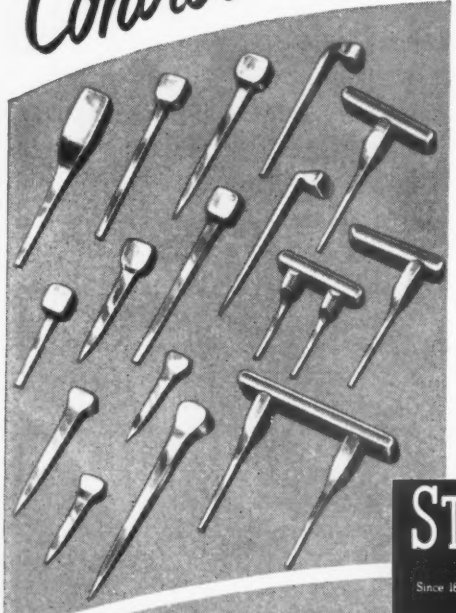
Control Foundry Chilling with CHILL KOOLHEAD NAILS



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Choose any style chill nail from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Same types available in Stainless, Brass, Aluminum, Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types, also made to your individual specifications.

Write for detailed descriptions and prices

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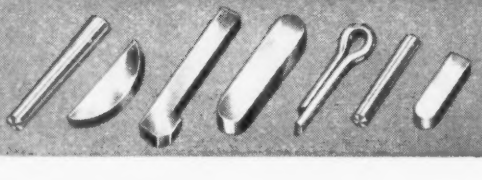
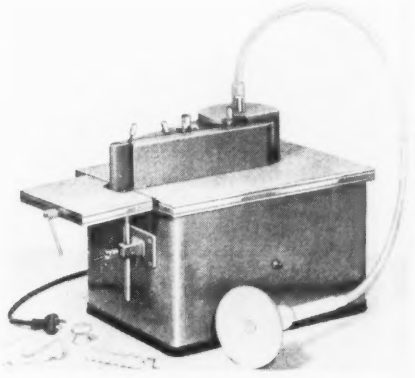


Other Products
PINS STEEL Stanho PRODUCTS KEYS
SPECIAL PARTS

sionals and peak vibrations, and operation as a clutch or a brake in combination in either direction.
For More Details Circle No. 25—Page 259

Belt Sander: Von Jonker Corp., Irvington Station, Indianapolis 19—Belt sander uses only one rotating drum, the driving drum, which is



directly connected to the motor and has small radius, changeable tips for the opposite end of the belt. It employs a 3 x 27 in. abrasive belt driven by a ½-hp motor, has built-in dust collection, adjustable end and side tables, a simply adjusted belt, belt guards and a toggle switch to control the motor. Used with various abrasive belts, the machine shapes and finishes wood, plastic, fiber, leather, glass and metals. It is useful for deburring and finish-shaping small castings, stampings and die castings. It can be used to sand flat surfaces, but is more useful for working unusual shapes that ordinarily require hand sanding. The vertical motor shaft provides a power take-off for a flexible shaft on which a sanding disk, drum or cone can be operated.
For More Details Circle No. 26—Page 259

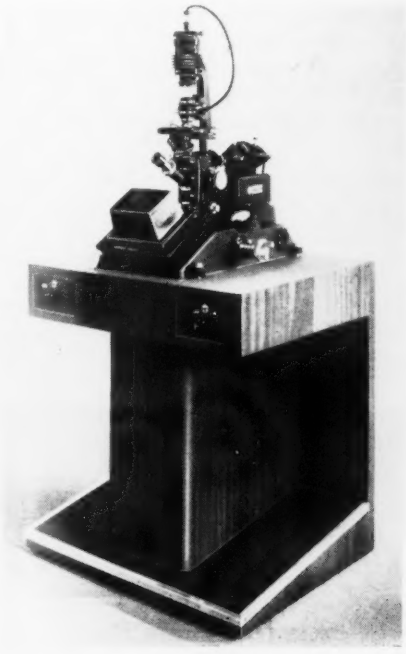
Hydraulic Weighing Units: A. H. Emery Co., New Canaan, Conn.—Line of self-contained, portable hydraulic weighing units now is stocked in sizes up to 50 tons. Systems are available in 24 ranges from 0.500 lb to 0-100,000 lb. Four load cell sizes offer a choice of 8½, 12 and 16-in. indicators. Each unit contains one of the company's load indicators mounted directly on a hydraulic force-measuring cell. Guaranteed to be accurate in use to within 0.25 per cent of full scale, these systems are calibrated to within 0.1 per cent of full scale when shipped.
For More Details Circle No. 27—Page 259

Lighting Fixture: Crouse-Hinds Co., Syracuse 10, N. Y.—Threaded connections of explosion-proof lighting fixture have been redesigned to prevent liquids, vapors or dirt from entering bulb and receptacle areas.

Fixture is lighter, easier to install and relamp and is said to have 5 to 10 per cent greater lighting efficiency than previous models. Notches in hood and globe holder permit loosening globe holder with a screwdriver, even after it has been exposed to dirt-laden air or corrosive vapors for a prolonged period. A large, knurled thumb screw between the notches locks the holder in place. All types of reflectors are available on 100, 150, 200, 300 or 500-w fixtures. Accessories available include breather, three contact receptacle, frosted globe and half-shade.

For More Details Circle No. 28—Page 259

Universal Microscope: Oppelm Co., 352 Fourth Ave., New York 10—Magnifications from 4 to 3000X can be run with continuity on ground glass camera screen of universal microscope designed for either research or routine work in metallurgy and other fields. Without recentering, magnification of any objective setup instantly can be increased or decreased four times. Macrophotography can be done down to 5X without disturbing specimens. While studying specimen, observer can make



quick changes of accessories. Eyepiece viewing and photographing on both still and movie cameras can be done simultaneously. When transmitted light is used, projection up to 20 ft on a 40-in. screen also can be performed at the same time.

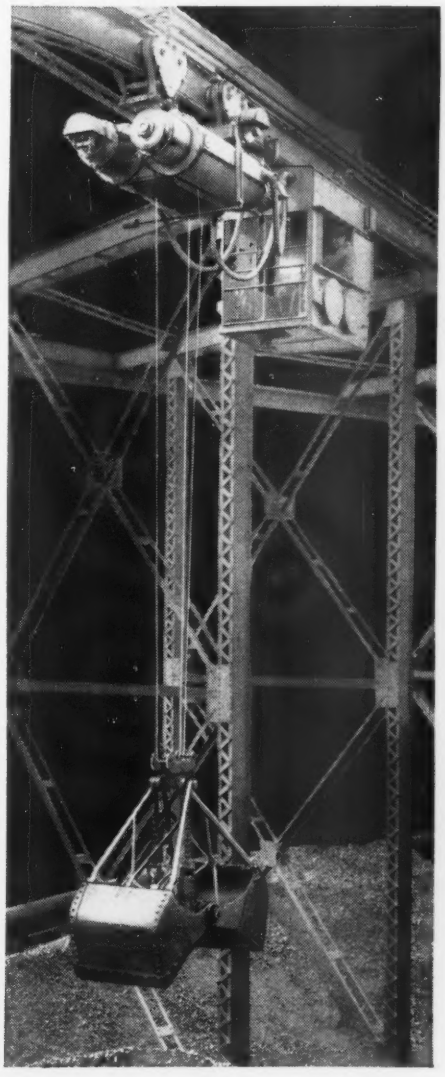
For More Details Circle No. 29—Page 259

Lift Truck Differential: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Special differential is designed to give full power to both drive wheels of the firm's LT-60 lift

Cut handling costs...

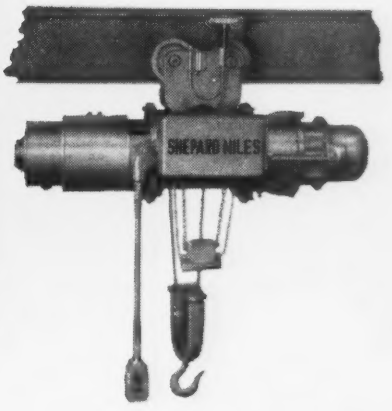
with **SHEPARD NILES**

Through-The-Air Equipment



No system of handling serves your whole plant at less cost than thrifty through-the-air handling! With a Shepard Niles cab or floor operated hoist, you move heaviest loads swiftly, safely—eliminate rehandling—speed production—save manpower. At the same time, you put unused ceilings to work — make more space for machinery and storage.

Let thrifty through-the-air handling help you cut costs. Just make certain you select the right hoist! Call in the Shepard Niles representative to talk over this problem—he's a specialist in loads through-the-air. Send for Bulletin today describing Shepard Niles Monorail Hoists — and arrange to have a representative stop by.



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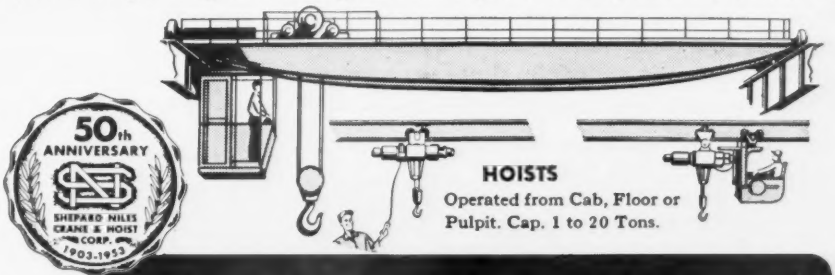
Overhead: Top Running, Inner Running, Under Running, Floor or Cab Operated. Cap. 1 to 450 Tons.



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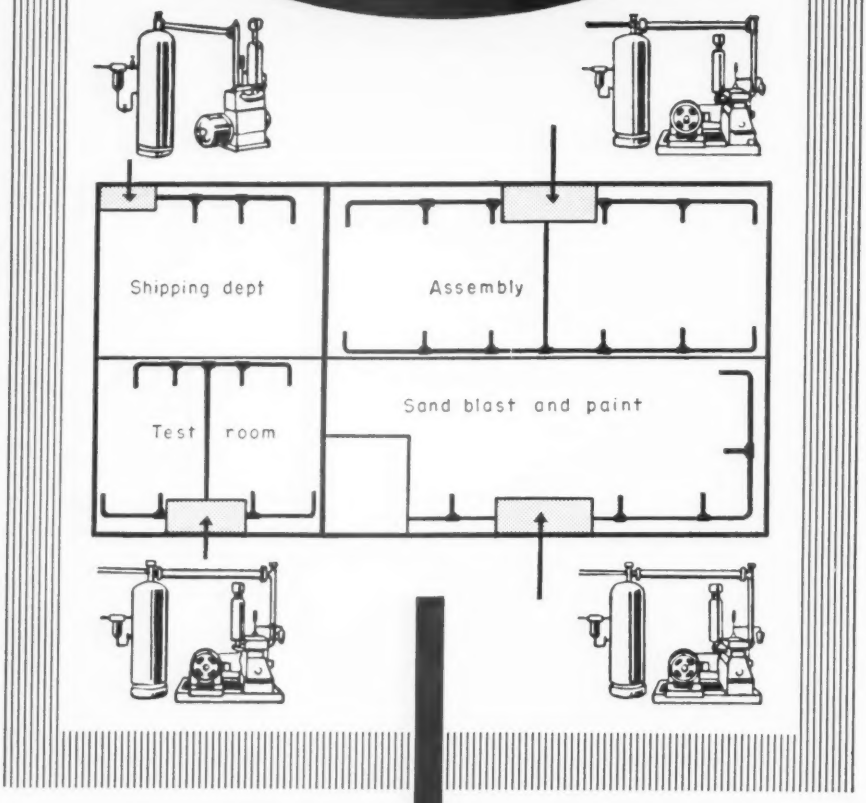

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with the SCHRAMM UNIT SYSTEM

The perfect, money-saving, "inside-the-plant" air compressor installation is the Schramm unit system . . . whereby, in a minimum of space, you install one, two, three or more Schramm air compressors, according to your air needs, and operate them separately, or as one unit, as the load requires.

1. Low in initial cost. No foundation cost, cuts by half the installation price. Can be transported into the plant on standard material handling equipment, set in place, grouted, bolted down, ready for use immediately.

2. Low in operating cost. The losses when operating a large compressor at light load are very great. On the other hand, the vertical compressors in unit system can be equipped with automatic start and stop control, set at proper pressure ranges, so as to regulate the air output according to load demand. Unit system installations allow you to use one, or as many of the compressors as you need.

SCHRAMM INC.

The Compressor People

WEST CHESTER PENNSYLVANIA

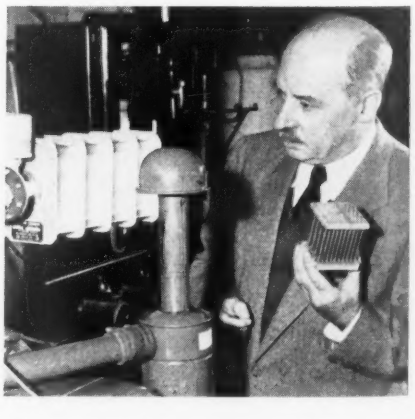
trucks under any operating conditions as well as to compensate for differences in wheel speed when truck is turned. It consists of two pairs of clutch teeth and two pairs of cams, so arranged that when the lift truck is traveling in a straight forward direction, the clutch teeth and cams are engaged fully, applying a driving torque to both drive wheels. Clutch teeth and cams are positioned so that neither wheel can rotate more slowly than ring gear speed. Needless speed is eliminated on either wheel, regardless of direction of movement. Offered as optional original equipment, the unit is interchangeable with the standard LT-60 differential.

For More Details Circle No. 30—Page 259

Angle Dresser: Royal Oak Tool & Machine Co., 29800 Stephenson Highway, Royal Oak, Mich.—Inexpensive wheel dresser for dressing angles on grinding wheels has a graduated base and a 5-minute vernier to permit precision setup and dressing. Diamond tool is mounted in a hardened steel block. Dressing is accomplished by sliding the block across the hardened, ground surface of the dresser plate, which can be set to any desired angle. Inverted "T" slide permits dressing the wheel on either side. Although designed specifically for use on bench model radial relief grinders, the machine can be used on almost all other cutter grinders and toolroom outside diameter grinders.

For More Details Circle No. 31—Page 259

Fork Truck Muffler: Oxy-Catalyst Inc., Wayne, Pa.—Catalytic fork truck muffler removes carbon monoxide and hydrocarbon fumes

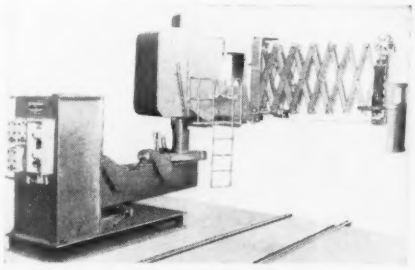


from gasoline engines and permits safe operation of fork trucks in confined areas. Basic unit of the muffler is a cartridge of spaced porcelain rods coated with catalytic alumina and platinum alloy. Engine exhaust flows across the surface of these rods where combustion of car-

bon monoxide and other harmful vapors takes place, and leaves the catalyst containing mostly carbon dioxide and water vapor, with only slight traces of the original contaminants. Mufflers come in standard sizes for any make or size of fork truck, and replace the usual muffler. The unit does not create back pressure. It can be used on any engine that runs on leaded gasoline, according to the manufacturer.

For More Details Circle No. 32—Page 259

Boxcar Unloader: Stephens-Adamson Mfg. Co., Aurora, Ill.—Boxcar unloader that is mounted between two tracks can remove material from cars on either track and is designed



to handle sand and practically all other bulk materials up to 2-in. lump size. A pantograph arm equipped with a scoop reaches into the car until it meets an obstruction; it then drops down, withdraws a load of material and discharges it into a trackside hopper. This cycle continues automatically; the single operator needs only enough time from other tasks to direct the arm to different sections of the car. Unloader occupies an area approximately 8 x 24 ft when not in use and requires a single concrete footing for trackside mounting.

For More Details Circle No. 33—Page 259

Relays: General Electric Co., Schenectady 5, N. Y.—Braided shunt which has been repositioned to reduce tension and wear is said to extend operating life and increase flexibility of application of a new line of general purpose relays. Use of the standardized open-form relays with conversion kits, which may be stocked separately, is reported to provide units with greater utility and to permit reduction in inventory. Conversion units are available for metal and compound base back mounting, base receptacle and relay jack-plug applications and also explosion-proof enclosures for dust-tight and Class 1, Group D service. The relays are rated from 6 to 300 v; 60, 50 and 25 cycles plus dc; and for 10-amp continuous contact rating. Contact arrangements include double-pole single-throw, double-pole

"FALLS BRAND" ALLOYS

AMERICA'S LARGEST PRODUCERS OF ALLOYS

"FALLS"

MANGANESE COPPER

Manganese copper is used principally for the introduction of Manganese into brass, bronze and nickel silver. It is supplied in the form of shot or bars that can be cut to any reasonable weight that the user may require.

GRADE "A"—*will conform to the following composition*

Manganese	28.5 to 31.5%
Total Impurities	0.5% Maximum
Copper	Balance

GRADE "B"—*will conform to the following composition:*

Manganese	25.0 to 30.0%
Total Impurities (Principally Iron)	3.0 to 5.0%
Copper	Balance

"FALLS" MANGANESE COPPER is also used for deoxidizing brass, white nickel casting alloys and nickel silver containing lead. As well as being an active deoxidizing agent Manganese has great affinity for sulphur and this combined with its ability to absorb gases makes "FALLS" MANGANESE COPPER a very important alloy for use in the foundry.

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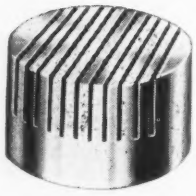
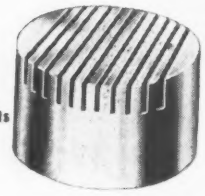


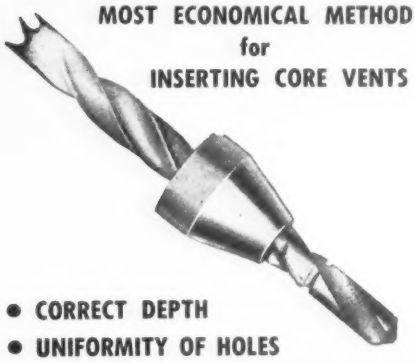
X-TRA DEEP HEAD
.156
Wide Slots
.014

DEEP HEAD
.093
Wide or Narrow Slots
.014 .010



SHALLOW HEAD
.031
Wide or Narrow Slots
.014 .010

INSERTING DRILL
MOST ECONOMICAL METHOD for INSERTING CORE VENTS



- CORRECT DEPTH
- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT

VENT CLEANER
FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

MANUFACTURERS OF PRECISION MACHINED-GROUND PARTS TOOLS - GAGES - FIXTURES

C.M. SMILLIE & CO.
1124 WOODWARD HGTS., FERNDALE 20, MICH.

double-throw and single-pole double-break. Relays can be used as starters for small AC motors where motors have sufficient overload protection.

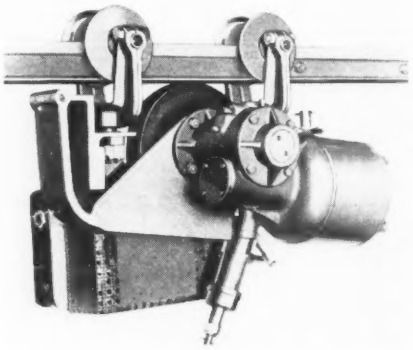
For More Details Circle No. 34—Page 259

Skid Racks: American Metal Products Co., 5959 Linsdale Ave., Detroit 4—Skid racks are made in prefabricated sections that are as-

sembled without bolting, welding or use of any tool other than a hammer. Made of heavy-wall, square tubing, they assertedly are capable of carrying great weight and of being tiered to any height desired and are available in standard, heavy-duty and extra heavy models.

For More Details Circle No. 35—Page 259

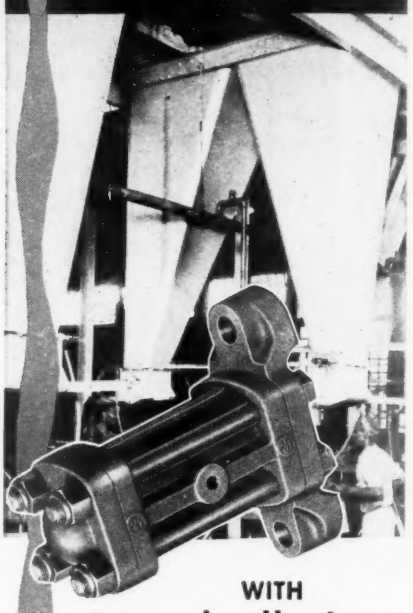
Monorail Drive Unit: American MonoRail Co., 13104 Athens Ave., Cleveland 7—Monorail drive unit for propulsion of ordinary loads on standard monorail track, electric hoists or other monorail carriers offers direct, right-angle motor drive through a



2½ x 8-in. rubber wheel. The drive wheel is adjustably spring loaded against the bottom of the monorail track. Fabricated mounting frame permits easy access for replacement because of its hinged construction. Standard specifications cover push-button control for either the drive unit alone or for it combined with electric hoist operation.

For More Details Circle No. 36—Page 259

shake-DOWN
HANDLING COSTS



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SPO air vibrators increase the production capacity of molding machines, facilitate removal of match-plate patterns from sand molds, perform shake-out operations and assure steady flow of granular materials from hoppers, bins and chutes. There's a **SPO** for every purpose!

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Malleable Conference

(*Continued from page* 181)

of a film, "Mechanical Equipment for Shell Molding," produced by Mechanical Handling Systems Inc., Detroit.

Pearlitic Malleable—Feature of the second part of the session on "Progress in the Foundry Industry" was a discussion of "Pearlitic Malleable," by Harvey E. Steinhoff, vice president, and Lyle Jenkins, metallurgist, Wagner Malleable Iron Co., Decatur, Ill. To set the stage for consideration of the market possibilities of pearlitic, Mr. Jenkins presented an interesting discussion of the extensive mechanization and modernization program undertaken by Wagner during the past five years. This includes cupolas, air furnaces, sand preparation plants, mold conveyors, radiant tube fired continuous type annealing furnaces, and improved techniques and methods. Recognizing the tremendous sales potential of pearlitic, facilities and operations were arranged for production of that metal.

Wagner produces pearlitic by a high velocity air quench, the process being based on definite metallurgical controls to assure uniform quality. Castings are heated to 1750° F for 10 hours, held for 25 hours, lowered to 1700° F for two hours and then lowered to 1650° F for two hours, which completes the first stage of graphitization. At the end of the cycle, four cases of castings totaling approximately 2000 lbs are discharged, and dumped onto a shaking pan feeder. The feeder distributes the castings uniformly onto a 10 ft wide by 35 ft long traveling mesh belt conveyor. The conveyor is hooded and cool outside air is used to cool the castings through the critical range. Within three minutes the entire load is cooled to a dull red heat.

Mr. Jenkins stated that physical tests indicate an ultimate tensile strength of 90,000 psi, a yield of 60,000 psi, an elongation of 5 per cent and a bhn of 241. Pearlitic castings have no decarburized layer on the surface because the containers are provided with covers, and the atmosphere in the furnace is controlled to a high CO/CO_2 ratio.

Mr. Steinhoff stated the Wagner organization produces small castings with an average weight of about ¾-lb. Output at present is between 15,000 and 20,000 molds and approximately 120,000 castings daily. Production in 1951 was negligible, in 1952 it was 300 tons, and the forecast for 1953 is 2500 tons. All of the pearlitic business is new, representing conversions from competitive materials and is

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Please check the products which interest you, fill in the coupon and we will be glad to send you samples of our GOOD foundry products.

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	"MOLDUKO"* CORE & MOLD WASH Produces smooth castings—Stops "burning in"—Airdries Will ship **10 Gals. of Molduko & 25 lbs. of Filler** at full drum prices for test purposes.
	HYDRO GRAPHITE *(It's New!)* Excellent permanent mold wash.
	"CARBON-RAISER"* (Add to the metal in the ladle, at the spout, in the furnace or in the cold charge) **IRON FOUNDRIES** use to control depth of chill and improve the machineability of the castings. **STEEL FOUNDRIES** use to control carbon content, in the ladle and in the furnace quickly, accurately and efficiently.
	PARTING (DRY or LIQUID) Non Silica or Tripoli, Highest Quality
	PIPE REDUCER Used on "Gates" and "Risers" in Steel & Iron foundries.
	PLUMBAGO & CORE WASHES In both Dry and Paste forms.
	LADLE WASH
	MUDDING COMPOUNDS
	CORE PASTES Strong bond, Dry quickly.

* *These trade marks Reg. U.S. Patent Office.*

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SUPERIOR FLAKE GRAPHITE COMPANY

Manufacturers of mold and core washes, facings, parting compounds, core paste, carbon-raiser.

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business the company would not have secured if it had not entered into the pearlitic field.

The Wagner company is so optimistic concerning prospects in the pearlitic field that it expects that type of production to exceed its regular malleable business within a few years, according to Mr. Steinhoff. Since pearlitic castings must withstand the severe service conditions of competitive materials they will replace, quality is most important. Defective castings, or castings of inferior quality, could destroy the confidence and reputation of the product and the market which lies ahead for the industry. Therefore, pearlitic castings must be an engineered product. In conclusion, Mr. Steinhoff suggested that the industry select some euphonious name for pearlitic malleable which is more symbolic and characteristic of the product.

Casting Inspection — Speaking on "Nondestructive Testing," Kermit A. Skeie, Midwest district manager, Magnaflux Corp., Chicago, stated that the foundry inspector has increased in stature because of his tremendous potential in cost and scrap reduction. When adequately equipped, he may increase the output of the molding department by as much as 10 per cent without an increase in personnel. Tools for testing must be used to aid in making acceptable castings, not to reject castings.

Cost per pound of the casting may be influenced greatly through the use of nondestructive testing methods for detection of potential scrap at its source, according to Mr. Skeie. Cost of machining and further processing also may be reduced through nondestructive testing. The ultimate result of these practices is assured customer satisfaction.

The last paper in this group entitled "Machinability of Malleable Castings" was presented by L. V. Colwell of the Department of Production Engineering, University of Michigan, Ann Arbor, Mich.

Future Growth—Lowell D. Ryan, managing director of the society, in a talk "The Metal Market Spectrum," said that while the industry has expanded some since 1946, this growth has taken place in too few companies. As an indication of what the malleable industry may anticipate in the next 20 years, Mr. Ryan quoted from the Paley Report prepared by the President's Materials Policy Commission. According to the predictions of this report, the malleable industry should be prepared to produce approximately 1.5 million tons by 1975, an increase of 200,000 tons over the present estimated capacity of the industry.

Mr. Ryan expressed approval of the idea of establishing regional clinics for salesmen to discuss common selling problems, now under consideration by the society. As the first task of such a program, he suggested trying to define the fundamentals of the industry's marketing problem. Following this discussion, consideration should be given to determining the outstanding merits of malleable and how those virtues can best be exploited. If these clinics and discussions should result in each individual company attacking the marketing problem in its own way and within the limits of its own resources, Mr. Ryan predicted that the industry would be astonished with what might be accomplished within the next five years.

The speaker also urged that the word "cheaper" be replaced with more descriptive terms, such as "more economical," "lower cost," "cost reduction," or "saving." Advertising executives who have studied the marketing problem believe the industry has a good story to tell, a good product to sell, and that there should be no problem in illustrating

DOES BERYLLIUM COPPER MAKE A GOOD SAND CASTING ALLOY?

How would you react to the statements below?

BERYLLIUM COPPER IS INEXPENSIVE TO HANDLE

Quite true. The low pouring temperature of beryllium copper (nearly 1000 degrees less than that of steel) greatly simplifies foundry procedure. Makes it easier to handle, too. Foundrymen say molding and gating techniques are similar to those for the bronzes.

BERYLLIUM COPPER SAND CASTINGS ARE ONLY USED FOR ELECTRICAL EQUIPMENT

Dead wrong. While it is true that high conductivity makes Berylco beryllium copper ideally suited for heavy electrical and electronics applications, the machine tool, ordnance and marine industries—to name a few—make good use of Berylco sand castings. Berylco's chief advantage lies in its excellent fluidity, which makes possible intricate "as cast" detail, reduces machining, and gives the designer greater freedom.

IT'S HARD TO MACHINE BERYLLIUM COPPER

A misconception. High-strength Berylco alloys can be readily machined as cast or in the annealed soft condition, then hardened by a simple low-temperature heat treatment. High-conductivity alloys can be easily machined in the fully heat-treated condition.

BERYLLIUM COPPER SAND CASTINGS HAVE HIGH FINAL PROPERTIES

And how! The heat-treatable feature of Berylco beryllium copper offers a combination of high final properties impossible to get in any other material. Through age hardening, Berylco castings attain a high degree of strength and hardness —tensile strength of 180,000 psi, Rockwell hardness of C43, Brinell hardness of 425 in some alloys, or conductivity as high as 50 percent in others.

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the virtues of malleable iron.

Another look at the sales potential of the malleable industry was given by H. R. Clauser, managing editor, *Materials & Methods,* New York. While the malleable industry for years found markets with relative ease, new materials and methods of fabrication in recent years have provided increasing competition. We are in a period of reshuffling in the field of engineering materials. For that reason, it is important that the malleable industry examine regularly its present as well as its potential markets.

Mr. Clauser pointed out that present consumption is concentrated in the automotive market and this can lead to difficulties. Therefore, it is necessary that the industry endeavor to capture other markets. A study made by the speaker shows that men who specify materials know too little about malleable iron. This lack of information indicates that the industry is using too few marketing tools, or those being used are not sufficiently effective. Mr. Clauser paid tribute to society activities, including the movie "This Moving World," Malleable Iron Facts and the handbook, although he suggested breaking the latter into two volumes, with only information of interest to the engineer or purchaser included in one. He said that individual companies probably are not taking full advantage of manufacturers' literature, and advertising in the technical and business press.

Intelligent Selling—While great progress has been made in manufacturing procedures and the quality of malleable castings, the industry should spend more time in ringing door bells, according to George T. Boli, president, Northern Malleable Iron Co., St. Paul, Minn., and vice president of the society. This can be accomplished by intelligently exposing the services of malleable foundries to prospective users of malleable castings, rather than depending upon them to seek out sources of supply for themselves.

Mr. Boli emphasized that today customers are better informed than ever before. Most customers have engineers, and while they frequently are not the best casting designers from the standpoint of foundry processes, nevertheless the parts are based on engineering principles. To meet this challenge, foundries should have sales engineers able to discuss the customer's castings requirements on a technical basis. Mr. Boli stated that competing industries are utilizing an aggressive sales approach and the malleable industry should do likewise.

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NON-FERROUS ALLOYS

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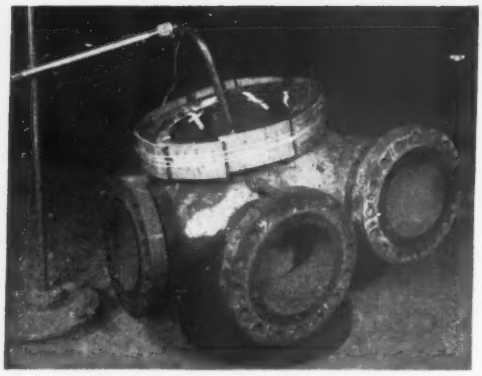

Radiographing a flange on a heavy steel casting.

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The use of gamma rays in radiographing steel castings has greatly increased since 1930, when the first commercial use of radiography was introduced. Radium radiography is simple, economical and effective; because it may be rented or leased, the equipment doesn't require a capital investment. It is simple to operate because it doesn't require especially skilled operators. Today radium radiography is rapidly approaching the status of standard equipment in progressive steel foundries. Let us tell you more about the simplicity and economy of radium radiography. Write today for prices, terms and case histories. Your requirements promptly supplied.

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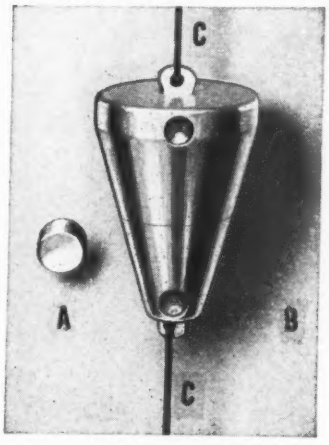

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use of malleable castings are being increased because customers and prospects are not sufficiently familiar with the good qualities of the product. Not enough sales effort has been made during the last 11 years of exceptionally good business. Furthermore, too many salesmen have simply been order takers and have failed to work intelligently toward conversions. In conclusion, Mr. Boli stated that as a result of his organization's attempts at conversions approximately 25 per cent of its present production comprises parts that were made of materials other than malleable two years ago.

Walter W. Bronson, president, Bronson & Townsend Co., New Haven, Conn., stated that today's successful salesman cannot be content merely with a thorough knowledge of his product, but also must have a thorough knowledge of his customers' business. Through this knowledge he can make a real contribution to his customers' business.

Cooperation on Salesman's Part

As an illustration, Mr. Bronson said this is what is expected of the salesman dealing with his organization: Have our business interests always in his mind; sell us only what we should carry in stock; see that we buy in the most economical quantities; offer us every advantage offered to other customers; keep track of our purchase orders and follow through with their delivery; and show courtesy in following our established procedures for interviewing salesmen.

Mr. Bronson then pictured the super salesman, the type that can make a real contribution to the success of selling. This salesman saves the time of the customer, knows his product, is alive to promotional possibilities and applies analytical self management to his work.

An interesting talk on the fundamentals of salesmanship was presented by B. Franklin Bills, B. Franklin Bills & Associates, Chicago.

Harold Brock, chief tractor engineer, Engineering Division, Dearborn Engineering Laboratory, Ford Motor Co., Dearborn, Mich., discussed the factors followed in selecting metals used to produce the Ford tractor. Mr. Brock pointed out that this tractor has a low weight factor which calls for high strength of materials. At times it is necessary that the materials have special properties. He suggested that foundrymen study the application of components and then come back with a material that can save money or provide other advantages. He believes that the thinking of top management has a definite

bearing on the selection of materials, regardless of the fact that specifications may be prepared by the engineering department.

W. J. MacNeill, vice president in charge of operation, Badger Malleable & Mfg. Co., South Milwaukee, Wis., conducted an interesting discussion on the subject "The Salesman's Duty—from Design to Shipment." A subtitle might have been "Some Common Problems that Face All Salesmen At All Times." Mr. MacNeill used a series of posters indicating what might be done in increasing the sale of castings. The first poster was entitled "Winning the Buyer's Confidence" and dealt with design, tolerance specifications, existing pattern equipment, samples and quotations.

The second, "Using Foundry Technical Know-How," included analysis of design, method of manufacture, cost estimate and delivery. The third, "Making Quotations Convincing," dealt with justification of casting design, customer benefits, explaining the quotation. The fourth, "Representing the Customer," dealt with protecting the customer's interest, follow-up on production of patterns and samples, and submitting respectable samples. The fifth, "Maintaining the Customer's Confidence," considered keeping delivery promises, checking customer's experience with castings.

To Increase Casting Sales

The sixth was "Broadening the Relationship," or "Go Get Another Job," and the seventh announced that the "Customer Is Boss." The discussion brought forth considerable comment from the floor and developed a number of don'ts that should be followed by salesmen in their contacts with the customer.

Otto Zmeskal, head, Department of Metallurgical Engineering, Illinois Institute of Technology, Chicago, discussed "Engineering Education and the Malleable Iron Industry."

We must not fail to learn to cope successfully with the magical gifts of science, declared Harry G. Walter, president, Gerrard Steel Strapping Division, United States Steel Corp., Chicago. Tremendous increases in productive capacity, especially in the metals industry, offer a challenge for sellers. But some have put on a little fat in sales thinking and have gotten a little soft in the era of order taking. Some have forgotten that a buyer's market is normal and natural for this country.

Mr. Walter stated that service figures in a sale because a loyal customer is created when the salesman and his company take a sincere interest in the welfare of the pur-

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OBSOLESCENCE

OBSOLESCENCE IS MORE than a matter of age—it's often Man-made. The fork trucks you bought from us 10 years ago were the best money could buy—THEN. But today they're obsolete.

And frankly, *we're* responsible for it. Obsolescence is the result of what we've been doing the past 10 years: constantly working on ways to improve those trucks. Our older models never saw the day when they could come close to what we're building now. These new CLARK trucks are designed to do more work—and do it faster, better and at lower cost. They're built to last longer. And with the multi-job attachments we've developed for them, they not only do more work, they do more *kinds* of work. Today's truck is amazingly adaptable and extra-useful.

Here's a complete line of modern trucks—gas, electric and diesel powered—that will outproduce your old equipment. You bought your original truck because you wanted to cut costs and increase efficiency. Now, competitive cost is more important than ever. And now is the time to replace the old equipment.

Your local CLARK dealer can give you the prescription for curing obsolescence—the specific reasons why *new* CLARK trucks are an investment in money-saving. Yes, you can blame us for obsolescence. But when you see what our new equipment will do for you, we're pretty sure you'll thank us for it.

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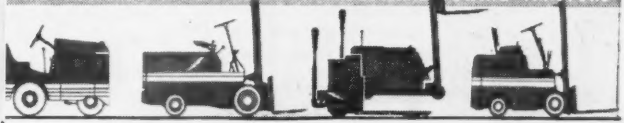
AND POWERED HAND TRUCKS · INDUSTRIAL TOWING TRACTORS



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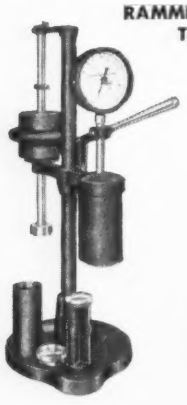
When consideration is given to the number of casting defects directly traceable to faulty sand practice, it becomes apparent that proper sand control is the short cut to low scrap losses.

The Gordon-Campbell sand testing units offer the latest improvements for checking these critical properties of sand mixtures: clay content, permeability, bond strength, moisture, core hardness, and core strength. The tests are quick, and no calculations are required. They offer the simplest approach to sand control.

Write for full particulars on Gordon-Campbell sand control units. Savings in scrap losses will pay for the program.

RAMMER-COMPRESSION TESTER—This simple unit combines ramming of specimens for permeability tests and making bond strength tests. Strength values are read on large dial.



PERMTESTER Permeability values for molding and core sand mixtures are shown on dial in a few minutes.

All Gordon-Campbell sand testing units are designed to conform with the recommendations of the Committee on Foundry Sand Research of the American Foundrymen's Society.

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chaser. One of the services is providing information about the products—what they are, what they will do, what benefits they offer, how much they cost, how they should be specified and when they can be delivered. Service sometimes is the solution of specific problems and suggestions for better materials. Mr. Walter concluded that it is time for salesmen to dig in on the grass roots activities.

The concluding address was presented by Frank O. Parker, vice president and sales manager, Dayton Malleable Iron Co., Dayton. Mr. Parker pointed out that since 1940 we have had a seller's market which has not been a good influence in building up a selling organization. The malleable industry is small and does not do much advertising. Little is written about it. Furthermore, the industry does not have a standard product and most of the selling is done by customers because they specify the product for their equipment. Therefore, the job of the malleable industry is to see that malleable stays in the design.

Must Inspire Confidence

Mr. Parker emphasized that if the industry wants to grow or to retain the business it now has, it will be able to do so only through the efforts of salesmen. It is necessary that these salesmen tell the technical and engineering people among the customers the advantages of malleable castings. The salesmen must help provide teamwork within their own organization. The smart outfit will do everything it can to help the salesman.

Mr. Parker stressed the point that if the producing company thinks it has the best salesman in the business, and the salesman thinks he has the best company in the industry, the customer soon will believe both impressions. The speaker also stressed the point that no person should be in sales unless he loves selling. A salesman must love people. To illustrate these points, Mr. Parker related a number of personal instances during his years of experience in selling malleable castings.

At the close of the meeting, a number of the younger representatives spoke briefly, explaining what they had gotten from the marketing conference and indicating the things which would help in planning the program for next year's repeat performance.

Following each day's technical session, which lasted from 9:30 in the morning until after 5 in the evening, a dinner was held at the Conrad Hilton Hotel, Chicago.

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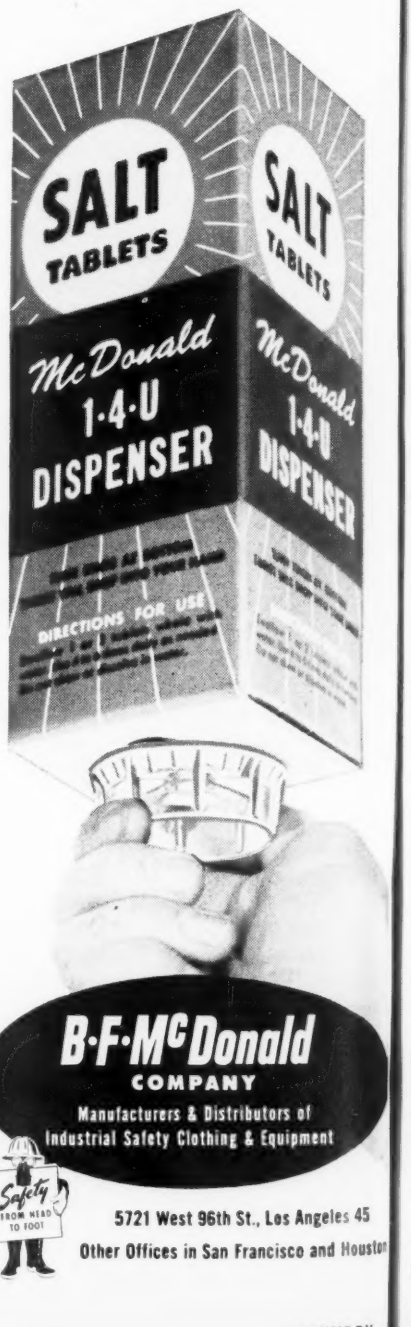

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Jobbing Shop Operations

(*Continued from page* 113)

thought of reducing the risk of life and limb surrounding the undertaking should be uppermost in all considerations. Thorough schooling should endow foremen with the idea that safety rates first among his company's goals.

Supervisors, the most vital cog in plant production, must be taught to adhere to rigid safety standards in their own departments. They must understand intimately each operation and develop the capacity to think an emergency application through in the brief interval between blueprint and production. They must be prepared to cope safely with the unusual demand of a customer; and the unusual—perhaps unlike the situation in many production-line foundries—is the stock in trade of the jobbing shop.

Through the foremen, workers in each shift must be guided constantly in safe working habits. This goal is not quickly or easily achieved. Infinite patience and diplomacy must be employed to obtain favorable results. With sound, day-to-day maintenance of equipment and with good housekeeping environments, accident frequency graphs invariably must show sharp downward trends.

Protection Against Injury — Foundries can launch a comprehensive educational barrage at new employees during their initial probation periods. These workers never should have to learn safety from fellow employees, but should receive clear instructions from the supervisors in direct charge of their departments. Emphasis should be placed, for example, on the fact, after safety devices have been made available, that a pair of goggles on a forehead never stopped a flying particle destined for the eye, or that a safety shoe left at home to air never saved a crushed toe at the plant.

To spotlight the hazards inherent in the jobbing foundry, let us consider common safety problems as they occur in each department.

Coreroom — The dangers in this work area arise chiefly from using heavy objects like coreboxes, core plates and baked cores. Transportation constitutes a hazard. Mixing mechanisms can be a source of serious accidents unless they are operated with the utmost care. Pilot flames and ventilating devices in the ovens must be kept in excellent condition.

Even a gas explosion in a housewife's small kitchen oven carries a tremendous impact. The same type

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of explosion can occur in these mammoth ovens, the devastation multiplied many times, if proper care is not taken.

As a general rule, eye injuries in this department should be practically zero, unless some of the coremakers persist in using compressed air to blow clinging sand grains from a used corebox instead of swabbing them off.

The man who mixes the sand should wear a respirator, and asbestos aprons and gloves should be furnished those handling hot cores. All personnel here should wear safety shoes.

Melting Department—If a cupola is used for melting, the tenders who ready the melting zone daily are subjected to falling particles during the chipping out and mudding up of the interior. Fumes and dust are present, and these men should wear respirators and shock helmets. The cupola tender who taps the metal is in a position to receive burns easily, but the wearing of goggles and asbestos gloves should minimize such incidents.

Elevators used adjacent to cranes with magnetloads of raw materials also are a fertile source of accidents unless strict safety measures are continually enforced.

During the melting operation, employees work under intense heat. The goggles issued for their use should allow for ventilation, to keep the lenses as fogproof as possible.

In many instances, it is desirable to give additional foot protection to the worker who makes up the metal charges. His handling of chunks of pig and broken pieces of scrap makes safety shoes inadequate for full foot covering. Obtainable from many safety manufacturing supply companies, metal shields that clamp over safety shoes give greater protection.

In the staging area, or metal preparation yard, the stacking of materials should be supervised closely to insure that no metal slides trap workmen.

Molding Department — Although work performed at the molding stations is much the same as that in the coreroom, the hazards are usually greater. The molder must handle flasks, molding sand, pattern and cores; a careless moment during any of these activities may spell trouble.

Molding sands must be mixed, like core sand, and machines in use today offer various designs. Some are closed to the operator, who relies wholly upon instruments on his control panel; others are open, with the churning action of their roller wheels or blades at the mixer's fingertips. On these machines, an operator grabbing samples in a manner not intended by the manufacturer may snag his arm.

The modern jobbing shop relies heavily upon mechanized aids to production. Roller and belt conveyors, electric and air hoists, overhead traveling cranes, monorails and an array of molding machines keep the foreman forever on the alert to detect unsafe practice associated with the use of this equipment.

A large percentage of molders in jobbing foundries work on a piecework basis, and they sometimes take chances with safety to gain additional production.

Many times cores must be secured in the cope of the mold preparatory to closing for pouring. Naturally, the molder must crawl underneath this object to wire or bolt the core in place. All too often, in a hurry and with dangerous confidence in the durability of the crane cable and flask trunnions, he motions for the craneman to hoist the cope and darts under to perform the task—with

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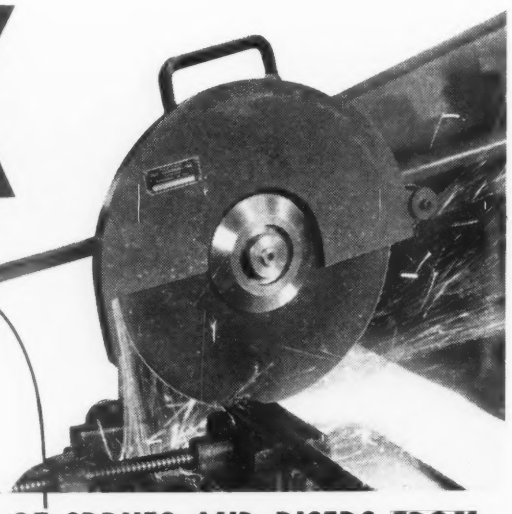

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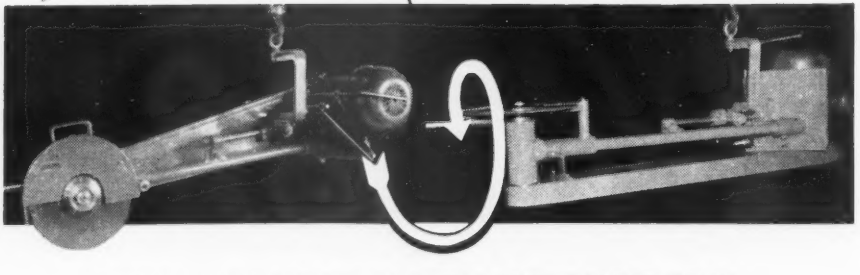

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nothing but blind trust in the mechanical and God to keep him from being crushed if something should break. And any number of things could fail. The supervisor must make certain that all possible safeguards are employed during molding operations, such as placing strong metal horses under the cope portion of the mold before anyone is permitted underneath.

Provided the molding area is well ventilated, no special protective apparel except safety shoes need be worn.

Pouroff and Shakeout—This work is generally conceded to be the most hazardous in the entire foundry, for the men are handling high-temperature material and are subject to burns. Those engaged in pouring metal should wear a type of goggle that affords maximum protection from exploding splash, and the lenses should be tinted to neutralize the glare given off by the blinding metal. Spats should be worn about the tops of shoes to keep metal from entering.

The shakeout crew, separating sand and flasks from the solidified but still hot castings, labors under conditions that are often hot and smoky. Fumes from the additives present in the sands make necessary the wearing of respirators. Asbestos gloves and safety shoes also are essential.

Although the entire plant should maintain trouble-free equipment, the handling of metal and very hot castings requires that the machines engaged in this work be absolutely "fail-proof." A cable that breaks or becomes unfastened or a hook that straightens can very well mean catastrophe on these shifts.

Very often these jobs are carried over into the night, and supervision may be sketchy compared to that offered during daylight work. Enlightened management is now recognizing the fallacy of utilizing second-rate foremen here, for the usual score then adds up to high accident totals and low productivity.

Cleaning Room — Without safe practices this department can keep the plant first-aid station busy with eye injuries and bruised hands and feet. Anyone entering this area should be well fitted with goggles. Ordinarily the castings have lost their high temperature by the time they reach the chippers, but protruding gates and risers on castings, with sharp edges and knifelike fins, present numerous dangers.

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here can contribute to trouble if employed carelessly. Good housekeeping in the cleaning room is difficult to maintain on an hour-to-hour basis, but nowhere else in the plant is it so necessary to safety. Poorly arranged work benches, crowded floor area, castings stacked too high—all these increase the chances of broken bones and maimed bodies.

Protective gloves, abrasive aprons, goggles and safety shoes should round out the equipment necessary to keep employees safe here.

A Continuous Program for Safety—The safety goals attained in the jobbing foundry are in direct proportion to the care and efforts expended to achieve them. Every inch of the jobbing foundry has its lurking hazards. Its confusing changes in patterns, methods and handling of materials call for innumerable split second decisions. They must be safe decisions.

Safety is a full-time partner of individual and company success; and a program should be beamed from all directions if it is to be assimilated easily. All personnel must be kept safety-conscious. Equipment in top condition is important, but it still can be abused to the point of breakdown if overloaded to do the *big* job. The safest machine can turn into menace with an absentminded or untrained operator. Keeping the physical and mental aspects of the jobbing foundry on a top level and attempting only jobs that the equipment can handle safely will pay rich dividends in reducing the accidents that plague this industry.

MIT Offers June Course In Physical Metallurgy

Massachusetts Institute of Technology, Cambridge, Mass., will offer a summer program in fundamentals of physical metallurgy June 16-26. MIT faculty members and lecturers invited from other universities and laboratories will present the subject as teachers, not as research scientists. Session topics include equilibrium and kinetics, diffusion, nucleation and solidification, precipitation and shear transformations, grain boundary phenomena, plastic deformation, stresses in metals and recrystallization and grain growth.

General level of the lectures will be adjusted to the metallurgist who has not had graduate work or who has been out of school several years. Further information and application forms for the program are obtainable from the Director of the Summer Session, room 3-107, MIT.

Light-Metal Alloys

(*Continued from page* 117)

an air-conditioned room in the laboratory. This equipment determines spectrographically up to twenty constituents of the metal, and records the data on a moving chart. Samples of the melts, in the form of disks about ⅜-in. thick by 2½ in. in diameter, are poured in metal molds and brought to the laboratory, where the alloy content is determined within one minute of the receipt of the sample. In addition, a well-equipped chemical laboratory for wet analysis makes further determinations of metal composition. Thus accuracy of composition supplements accuracy of dimension in the castings.

The melted magnesium alloy is protected from the air by a layer of powdered sulphur, and is poured into the molds at a dark red heat. In the larger castings, by the time the metal has filled the risers it has cooled until it is no longer red hot, and looks much like molten lead or solder.

Install Mechanical Equipment

At present, the castings are shaken from the molds by hand, but mechanical equipment is being installed in connection with the sand handling and reclaiming system. It is necessary to use considerable care in shaking out, to avoid bending or denting the pieces. After rough cleaning, the castings are shot blasted and the risers removed with band saws.

Solution heat treatment is carried out in eight large dual-control electric furnaces, and in two smaller furnaces. Two additional furnaces were recently added to this equipment. In the furnaces in which magnesium alloy castings are heat treated, an atmosphere of sulphur dioxide gas is maintained. In Fig. 3 a load of castings is shown being withdrawn from one large electric furnace.

On each shift a metallurgist is in direct charge of both the melting and the heat treating departments, thus carrying out the firm's policy of maintaining exacting standards at every stage of manufacturing.

In the laboratory are a tensile testing machine and an impact tester; the soundness of the castings is checked by two 140-volt x-ray machines installed in rooms adjacent to the finishing floor. Surface imperfections are also determined by means of vegetable dyes used for quick inspection of minor defects, and Zyglo equipment for more thorough examination. On castings that must be pressure tight, no welding is permissible. When defects may be repaired without detriment to the service qualities of the castings, Heliarc weld-

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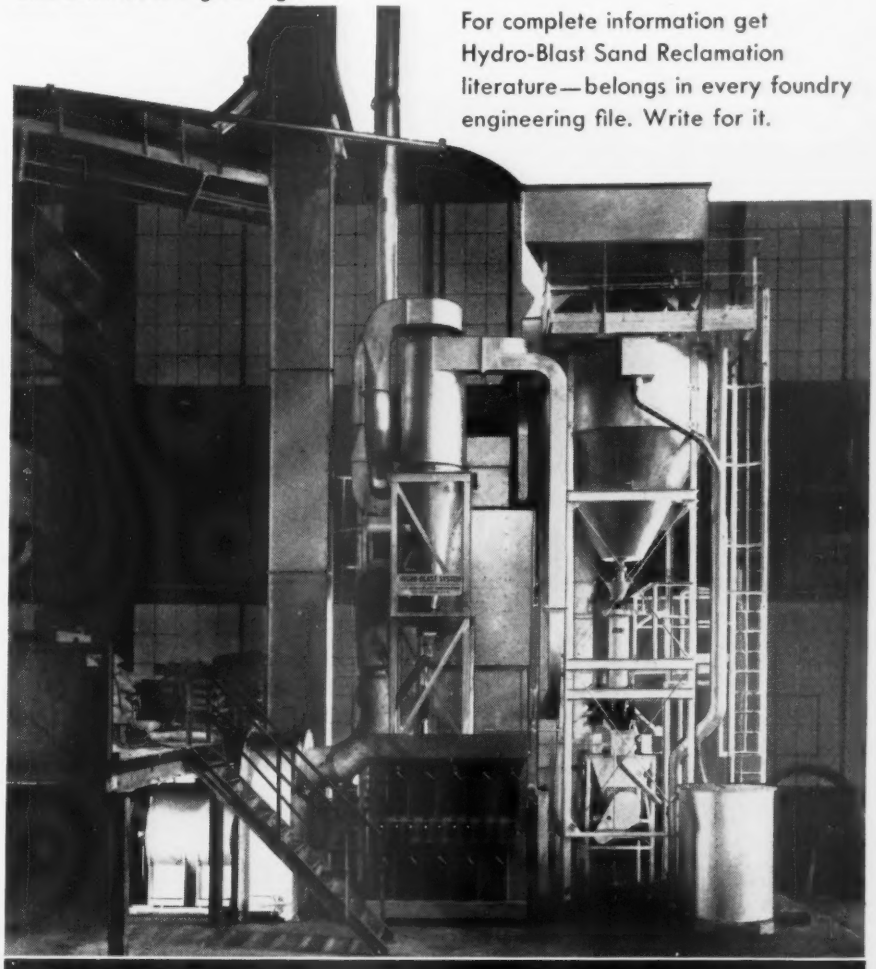

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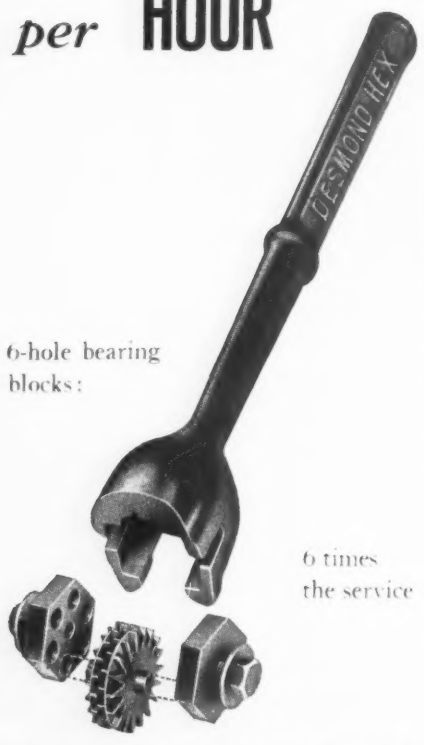

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ing is used to perform the job.

In a well-equipped lay-out room, shown in Fig. 4, all castings made from new patterns are carefully and thoroughly checked for dimensional accuracy, and sections are cut at all vital points to determine thicknesses. After any necessary changes in patterns and coreboxes have been made to correct deviations from standard shown in the first casting, a second one is molded and poured and given a careful going-over. If and when a satisfactory casting has been made, the job is approved for production.

The majority of the castings are shipped rough, but in a well-equipped machine shop, many of them are machined to customer's requirements.

The Rolle company makes a full line of castings in aluminum and magnesium alloys, including several that have been developed quite recently. In particular, they produce the ZRE-1 and ZT-1 magnesium alloys that are designed for service at high temperatures. Of these, ZRE-1 is applicable to temperatures up to 480° F, and combines excellent creep resistance with good room temperature properties, plus freedom from microporosity. The ZT-1 alloy, containing thorium, zinc and zirconium, has excellent creep and stress-rupture properties at temperatures up to 600° F.

Lists Many Alloys

The complete list of alloys produced comprises: Aluminum alloys—355, 356, 220, 142, 132, 195, 108, WAD 6344 (new); Magnesium alloys—AZ-91, AZ-92, AZ-63, ZRE-1, ZT-1, Z5Z.

The Rolle company recently produced the first of a number of the largest magnesium alloy castings ever made in the United States. They are for a military electronic unit, and are poured in AZ 63 (Dow H) magnesium alloy. The dimensions of the larger of the pair of castings, the base housing (Figs. 6-7), are approximately 93 x 114 x 33 in. and its weight is 1630 lb. The smaller, horseshoe-shaped casting, the yoke (Fig. 5), weighs 550 lb and measures 60 x 67 x 50 in. Average wall thickness of the ribs is ⅜-in., or approximately one-half that of similar castings made of steel. Rolle estimates, conservatively, that if made in steel, the base housing would weigh approximately 13,000 lbs.

The base housing is cast in a mold assembled from 197 cores. In designing the sections of this piece for production, a few additional openings in the sections were provided to furnish support for some of the cores. This was necessitated by the fact that the walls of the casting must be

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leak-proof, so that the use of chaplets for this purpose is out of the question. To insure thorough baking of the cores, their thickness was limited to approximately 9 in.

A machined plate 144 x 160 in. provides support for the core assembly. The first 9-in. course of cores is accurately located on the plate by means of lines scribed on it to show where each core is to be placed, as shown in Fig. 8. In addition, the plate is provided with locating guides to accommodate core checking fixtures used to locate accurately the successive layers of cores. When the assembly is completed, a 112 x 128 x 48 in. flask is set around it, and the 1½-in. space between cores and flask is then filled with molding sand to guard against run-outs.

Fig. 9 shows some of the cores for the third and fourth courses being set in position. Chills are set in the core of the third course, to equalize the solidification rate of the metal at points where ribs intersect. This core is also provided with pockets to give collapsibility. Fig. 10 shows the assembly of cores nearly completed, and Fig. 11 the flask in place ready for the cope.

Mold Cope in Green Sand

The pattern plate for the cope is shown in Fig. 12. The cope is rammed in a conventional section of flask, and is located on the drag with pins in the usual manner. Regular molding sand is used for the cope, and the pattern contains pads for locating the risers and the four down-gates.

About 5000 lb of magnesium alloy is required to pour the base casting. The metal is brought to the mold in four ladles, one for each down-gate. On the first 12 castings made, the conventional perforated tin screens in the runners were omitted, for fear that they might slow up the rate of pouring too much. On the 13th casting, however, these screens, used to reduce turbulence in the flowing stream of metal, were used, and no loss of time in pouring resulted.

The castings are left in the mold for three hours, then shaken out and cleaned, and the risers removed in the usual manner. The final step is solution heat treatment and aging.

The smaller of the two castings, known as the yoke, is molded in green sand in the horizontal position, in a flask 72 x 80 x 70 in. Forty-two separate cores are assembled in the coreroom into the seven delivered to the foundry. The parting line of the mold is at the median line of the casting. The total amount of metal required for each of these castings is approximately 2000 lb.

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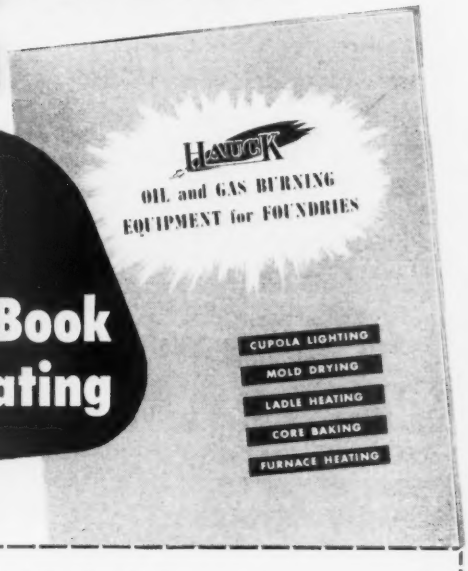

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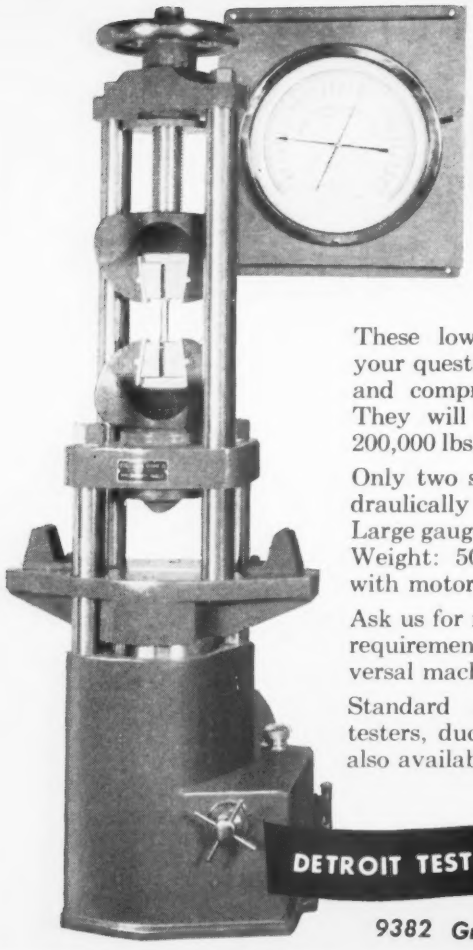

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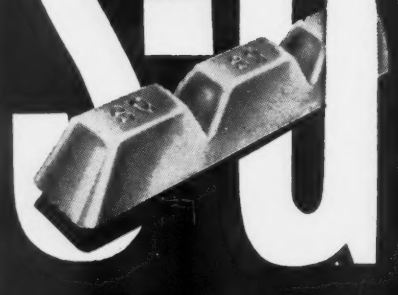

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White Cast Iron

(*Continued from page* 131)

If the neck of a feeder is unbalanced or too small for the casting, cohesive action therefore will start at this low temperature point and cause hotter metal to be drawn from two directions at the same time—i.e., from the casting and from the feeder. If the neck is balanced properly, this condition may not exist.

Cast Steel—In the transition of molten metal to the solid state, the contraction which occurs, as previously stated, can be divided into three stages: Liquid, solidification and solid (Fig. 1).

Commercial carbon cast steel starts to freeze at a high temperature as compared with white cast iron or gray iron. For example, a 0.05 per cent carbon steel freezes over a narrow temperature range of approximately 25°F, a 0.50 per cent carbon over a range of 350°F, and a 1.00 per cent carbon over a wide freezing range of 400°F (Fig. 3). It is interesting to note that unlike that of cast steel, the freezing ranges of white cast iron and gray iron decrease as the percentage of carbon increases.

If carbon were entirely absent, as in pure iron, solidification would start and end at the same temperature, and there would be solidification point, but no range. The solidification of a ferrous casting therefore is based on a time-temperature range, not on the assumption of sudden solidification at one, single temperature.

White Cast Iron—Solidification of white cast iron takes place progressively through a range of several hundred degrees. This process is shown in Fig. 1, in which is reproduced a part of the iron-carbon equilibrium diagram. For example, a 2 per cent carbon molten iron starts to solidify at point "A" (2446°F) and is not entirely solid until point "B" is reached, for a freezing range of 381°F. A 2½ per cent carbon molten iron starts to solidify at point "C" (2367°F) and ends at "D," for a range of 302°F, or a difference of 79°F for ½ per cent of carbon.

For this reason, other conditions being equal, a high-carbon iron having a lower temperature of solidification and a shorter freezing range should help to minimize internal shrinkage. In addition, white cast iron has a greater contraction, because of the carbide form of solidification, than a gray iron containing low density free carbon.

Gray Cast Iron—Gray cast iron containing 3 per cent total carbon starts to freeze at 2282°F and freezes

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over a range of 217°F. A 3½ per cent total carbon iron freezes over a range of 134° F, from a low temperature of 2200°F. Solidification takes place over a narrower range than that of white cast iron, but at a slower pace.

At the same time free, graphitic carbon is precipitated in the form of flake graphite, a substance with a specific gravity approximately one-third that of iron or iron carbide. The presence of this light, voluminous material uniformly distributed through the solidifying mass tends to neutralize excessive internal shrinkage (Fig. 3).

For this reason, castings of similar dimensions and like mold construction would have less internal shrinkage when cast with gray iron than when cast in commercial white cast iron or steel. A solid casting thus can be obtained with a high yield ratio between casting and feeders.

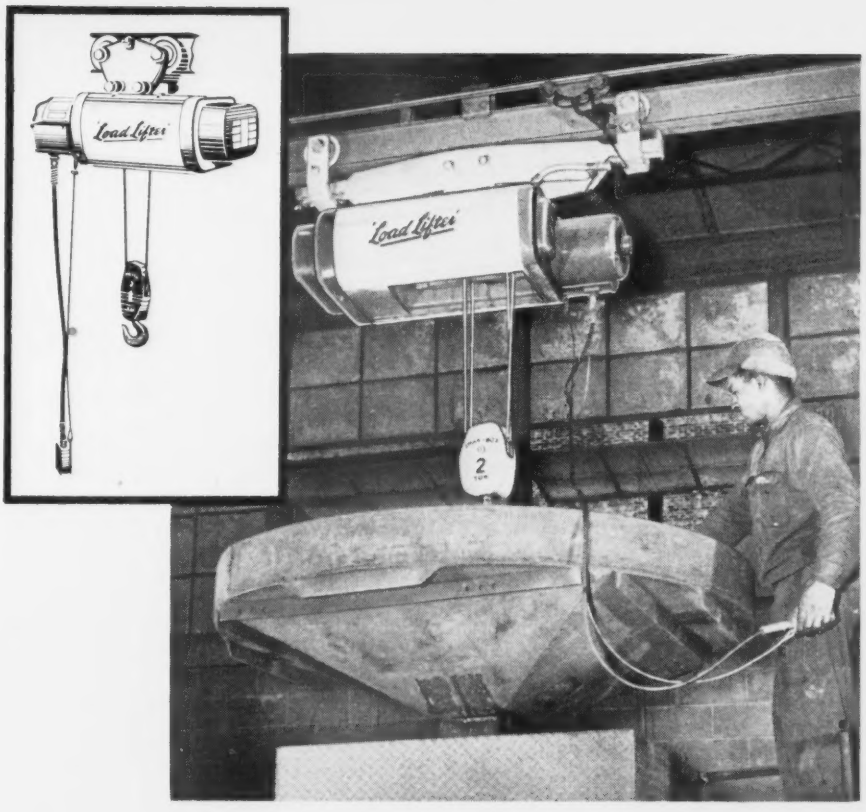
Gray Cast Iron Is More Fluid

We may point out also that the fluidity of gray cast iron is greater at any given temperature above the melting point than those of white cast iron or steel and that white cast iron is more fluid than steel as the temperature increases above the melting point. If gray cast iron is hypereutectic in composition, however, its fluidity may be impaired by the separation of free carbon in the form of kish.

From the foregoing analysis it may be stated that the elements primarily responsible for inverse segregation in white iron are compounds of carbon, phosphorus and sulphur, all of which solidify at a lower temperature than pure iron and create a condition for selective freezing. Because silicon and manganese are in solid solution with iron, they solidify in combination with it.

We are interested in the chemical relationship of these dendritic formations or primary crystals found in the heart of the test block as compared to the solid structure. Chemical analyses show that the solid metal is of practically the same analysis as the molten metal or ladle analysis. The porous area which consists of primary crystals in the center of the test block is lower in carbon, sulphur and phosphorus than the solid metal.

It is not uncommon among metallurgists, however, for some to believe that this shrink area or last metal to solidify is richer in carbon, sulphur and phosphorus. It should be remembered that the white cast iron test blocks were all poured from regular commercial heats, melted in



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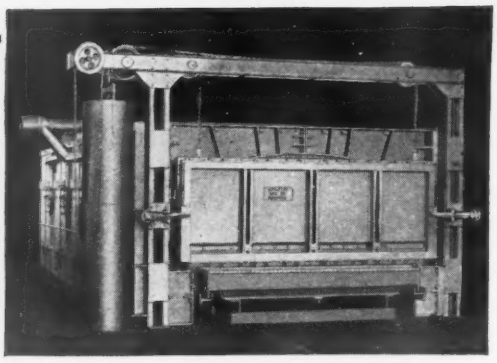

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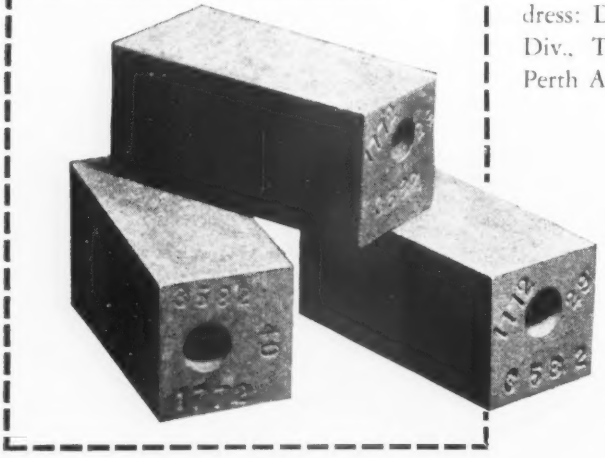

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an air furnace, and that all alloy additions were made in a 60-lb ladle.

The following analyses were conducted on our test block to ascertain the degree of inverse segregation that takes place in plain and alloy white cast iron. The following code letters were used to indicate location of sample: L. M.—ladle metal, 600 gram test bar cast in open metal mold; P. M.—parent or solid metal of test block; S. M.—shrink metal of test block.

HARD IRON (PLAIN)

Element	L. M.	P. M.	S. M.
C	2.50	2.47	2.07
Si	.94	.94	.95
Mn	.38	.39	.38
S	.088	.092	.075
P	.154	.160	.098
Cu	.21	.20	.20
Fe	95.73	95.75	96.23

CU, MN, ALLOY HARD IRON (Z-METAL)

Element	L. M.	P. M.	S. M.
C	2.53	2.49	2.03
Si	.94	.93	.95
Mn	.83	.83	.81
S	.090	.088	.080
P	.154	.158	.104
Cu	.80	.79	.83
Fe	94.66	94.71	95.20

MN, P, CU, HARD IRON ALLOY

Element	P. M.	S. M.
T. C.	2.36	2.20
G. C.	1.46	1.30
C. C.	.90	.90
Si	.92	.92
Mn	1.28	1.26
P	.974	.782
Cu	3.16	3.22

CARBON SILICON ALLOY* HARD IRON

Element	L. M.	P. M.	S. M.
T. C.	2.73	2.68	2.16
G. C.		1.94	1.37
C. C.		.74	.79
Si	1.60	1.63	1.63
P	.160	.160	.118

*Carbon and silicon added to a base metal having 2.60 per cent carbon and 0.90 per cent silicon.

MN ALLOY HARD IRON

Element	L. M.	P. M.	S. M.
C	2.63	2.60	2.02
Mn	2.07	2.02	1.92
NI—ALLOY			
C	2.34	2.28	1.84
Ni	1.27	1.27	1.20
CR—ALLOY			
C	2.48	2.48	2.10
Cr	1.79	1.83	1.59
C		2.43	2.14
Cr		.65	.54
V—ALLOY			
C	2.44	2.44	1.97
V	.38	.38	.24
C		2.43	2.08
V		.64	.48
MO—ALLOY			
C		2.43	2.10
Mo		.76	.57

As previously stated, carbon, sulphur and phosphorus are affected by solubility and selective freezing, and elements which form complex carbides, such as Cr, V and Mo, also segregate inversely because of association with the massive cementite. If we assumed the pearlite to be uniformly distributed in both the solid and shrink metal, the amount of massive cementite would be lower in the shrink metal than in the solid metal.

This difference in percentage of carbon is shown quantitatively when the carbon found in the shrink metal is subtracted from the carbon found in the solid metal. It is interesting to note that manganese, like copper, nickel and silicon, goes in solid solution with the ferrite and, as a result, is uniformly distributed.

Spot checks taken for total carbon in the solid metal of the test block showed it to be distributed uniformly (Fig. 4). The 0.40 per cent or 40 points less of carbon in the shrink metal is distributed uniformly in the matrix of the solid metal. For example, if we were to assume our porous or shrink area to be 3 cu in. in volume, its ratio to solid metal would be 1 to 21.

As a result, this actually would increase the carbon content of the solid metal approximately 0.020 per cent above the actual carbon content of the molten metal. However, this cannot be shown quantitatively because the two points of carbon difference is well within the limits of error of the method for the determination of total carbon in white cast iron. The same factors prevail for the other elements that segregate inversely.

Summary—To say simply that internal shrinkage is the result of a hot spot or the lack of metal is insufficient to explain this physical behavior of solidifying metal. The following briefly will define this property in more detail.

A porous area within a white iron casting is the result of a lake or pool of molten metal which has been so trapped as a result of unequal solidification and surrounded by solid walls of solidified metal that it has no inlet or outlet connections with molten metal in its immediate vicinity. Because of the lack of progressive solidification, this area or hot spot becomes porous by acting as a reservoir to supply molten metal to satisfy the solidification contraction of the surrounding primary crystals so that they may become solid metal at the end of the freezing range.

When the metal is completely solidified, an interlocking treelike structure is the result of this last metal to freeze, which consists of dendrites minus all or part of their fillings. For this reason, this shrink area is porous. In addition, as a result of selective freezing, inverse segregation of some compounds or elements takes place within this porous area.

The possibility of eliminating external feeding measures in producing sound ferrous castings has been an intriguing problem since the early days of metal casting. The formation of metal crystals involves a vol-

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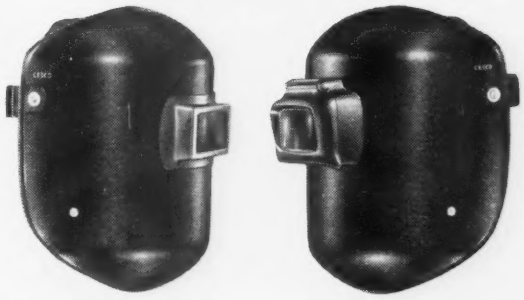

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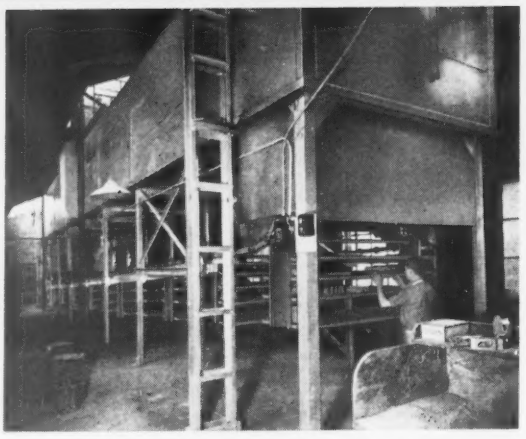

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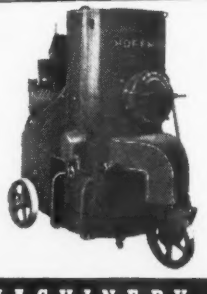

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ume decrease, and the development of a feeding riser is the outgrowth of the need for controlling this solidification contraction and promoting progressive solidification.

Other techniques also have been developed to help control this type of porosity and have resulted in improvement in physical properties and the economical position of ferrous castings. However, any other means of porosity control, such as seeding crystallization, which may uniformly distribute this volume decrease within a casting and prevent localized porosity, or a method that would cause the molten metal to freeze from the inside out, as it passed through the freezing range, may have a far-reaching effect.

As this subject of solidification is delved into, more and more problems are uncovered and some of them better understood. We have attempted to present in a practical way some of the forces active during solidification that must be balanced in order to produce sound castings.

The author has attempted to present in a concise form the results of his work and the viewpoints, theories and opinions of various others whose writings are available. The list is, by no means, complete. It is hoped that by reviewing the subject of porosity in white cast iron, other worthwhile means may be forthcoming which may reduce this problem.

Acknowledgement — The author wishes to express appreciation to Arthur Messerschmidt and Herman Thoke of Chain Belt Co.'s malleable iron and gray iron foundries for furnishing cast specimens and to David Zuege, Sivyer Steel Casting Co., Milwaukee, for cast steel specimens.

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Cracks and Hot Tears

(*Continued from page* 127)

shown as actual or estimated in Fig.7.

As will be noted, there is quite a difference in the strain concentration, in the order of 300 per cent, in the various test specimens. Some of the variations in test results can be explained by this variation in strain concentration. For example, there are some serious discrepancies between the results on the AFS test casting and those of other investigators. Fig. 7 shows that the strain concentration in this casting is of a different order of magnitude than in most other test castings. The high strain concentration in the AFS test casting also explains why this casting is so sensitive to minute changes in the dimensions of the slot gate.

Another discrepancy that possibly can be explained by this difference in strain concentration is that of carbon content as reported by Middleton and Protheroe[2] and Rassenfoss. Both investigators report that 0.15-0.17 per cent carbon steels have a greater resistance to hot tearing than 0.22 to 0.25 per cent carbon steels. However M. & P. report a slight decrease in strength before rupture as the carbon is increased to 0.40 per cent. Rassenfoss reports a decrease in hot tears as the carbon is increased to 0.45 per cent.

Although the method of restraint and evaluation of resistance to hot tearing is entirely different and may be the reason for this discrepancy, it is significant that M. & P's strain concentration is about double that of Rassenfoss. It is possible that the relatively higher strain concentration has overshadowed the beneficial effect of increased carbon found by Rassenfoss and that a greater increase in carbon is needed before a significant difference due to high carbon can be detected in M. & P.'s test specimen.

Temperature Gradients—This variable seems of equal importance to strain concentration. In fact both strain concentration and temperature gradients must be considered together as interdependent variables. Two axioms can be safely advanced:

1. If there are no hot spots in the casting, and therefore no temperature gradients, the casting can withstand infinite strain concentration without hot tearing.

2. If there is no strain concentration, there can be infinite temperature gradients without hot tearing. Contraction is unhindered.

There is nothing new or questionable about these two axioms in the qualitative sense. The important question is, how much? A possible

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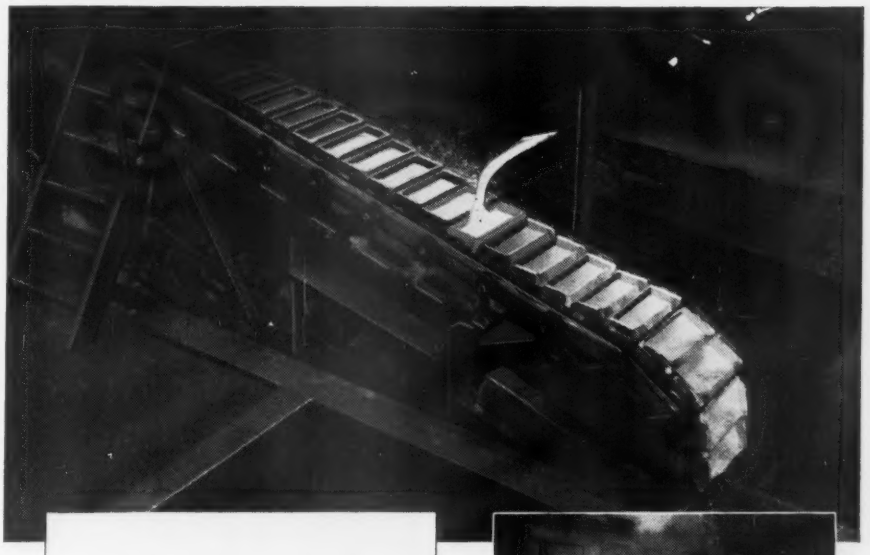

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hint can be obtained from Hall's and the writer's results. The hot spots in these two test castings are established by geometry and can be studied quantitatively. Unfortunately, the hot spots in the other test castings summarized in Fig. 7 are established by gating and metal flow, and the relative cooling rates are incapable of solution at present.

Hall's test specimen is ideally adapted to a study of this kind, for hot tearing is controlled by the diameter and length of the bulb. The relative cooling rate of this hot spot can be calculated from the areas of the round sections and can be more accurately described by surface area-volume ratios, in a manner similar to that now accepted for riser dimensioning[8]. A first approximation of the relative cooling rate of a junction of sections can be determined by the ratio of the area of the included circle of the junction (determined by the path of the hot tear) and the area of the circular contracting member.

FURTHER DISCUSSION WELCOMED

Because conflicting views still exist concerning certain of the theories connected with formation of cracks and hot tears in steel castings, both the author and FOUNDRY would welcome from readers further discussion of this subject for publication.

A first approximation of a relation between strain concentration, temperature gradients (measured by area ratios) and hot tearing is shown in Fig. 6. All but two of the points are taken from Hall's results[2]. If it were not that this chart is a quantitative extension of the two basic axioms that were just discussed, a boundary curve between hot tearing and absence of hot tearing could not be drawn from present data. A tentative curve is included for discussion.

The shape of this tentative curve is suggestive of the riser dimension boundary curves[8]. The two axioms are the mathematical asymptotes and suggest that the curve is hyperbolic, like the risering curves. It is logical that the curves should be similar. The risering curves are based on SA/V relations just as are the temperature gradient-strain concentration ratios. Risering is concerned with the relative cooling and solidification rates of the casting and riser down to a temperature somewhere in the solidification range when feeding is stopped by the interlocked solidified dendrites. In hot tearing we are interested in the relative cooling rates of two parts of the casting at a

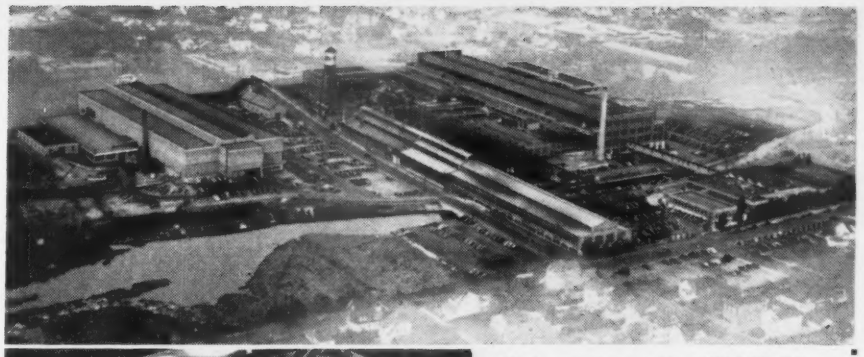
temperature only about 50° F lower than in risering. Therefore, the mathematical approach to both problems should be very similar.

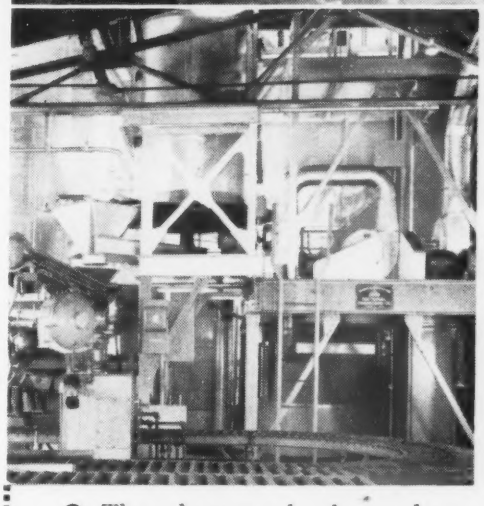
A mathematical approach and treatment of hot tearing has definite practical advantages, even now. The number of combinations of contraction strain (total and hot spot length) and temperature gradients is infinite, and thousands of test castings would be required for an empirical approach. A plan, even though not accurate at first, will save much work. This is emphasized by the solution of just a few examples along the line suggested by Fig. 6. These solutions show that the vertical abscissa must be extended five or ten times to include strain concentrations encountered in production castings.

Stress—This phase of hot tearing is the one that has caused the writer the most trouble, probably because his thinking is steeped too much with foundry tradition. If there is anything that is drummed into a steel foundryman's noodle—verbally and by castings themselves—it is that hard cores, hard ramming, flask bars in the road, fins, and misplaced core rods invariably cause hot tearing. Stress, stress, stress; if the core is too hard, something has to give and the casting cracks. If flask bars are in the road, or fins weld to the flask, the hot casting is the weakest link and it cracks.

This stress thinking also permeates much investigational work, as witnessed by Hall's[9] work in performing standard tensile tests on cast steel during and immediately after solidification. M. & P.'s work[2] with spring loaded test specimens, the results expressed in pounds load required for fracture, is another example of stress thinking.

B. A. & P.'s[2] work casts an entirely different light on the stress factor of hot tearing. The writer is indebted to Mr. Pellini for many hours of patient explanation as to the role of stress in hot tearing. In fact, this section is the writer's interpretation of Mr. Pellini's explanations. If B. A. & P.'s postulate that hot tearing starts while there are still liquid films between the solidified dendrites is accepted (and there is no reason to believe that this is not true), rupture can be initiated with practically no stress. The only stress required is that to overcome the interlocking of some dendrites and liquid surface tension. This stress would be measured in ounces per square inch. Stress in the classical sense, measured in pounds and thousands of pounds per square inch, cannot occur until the metal is coherent, and as long as there is liquid present





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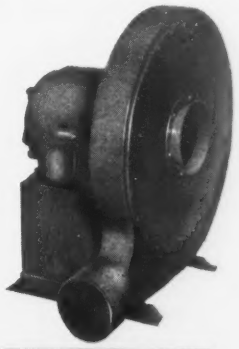

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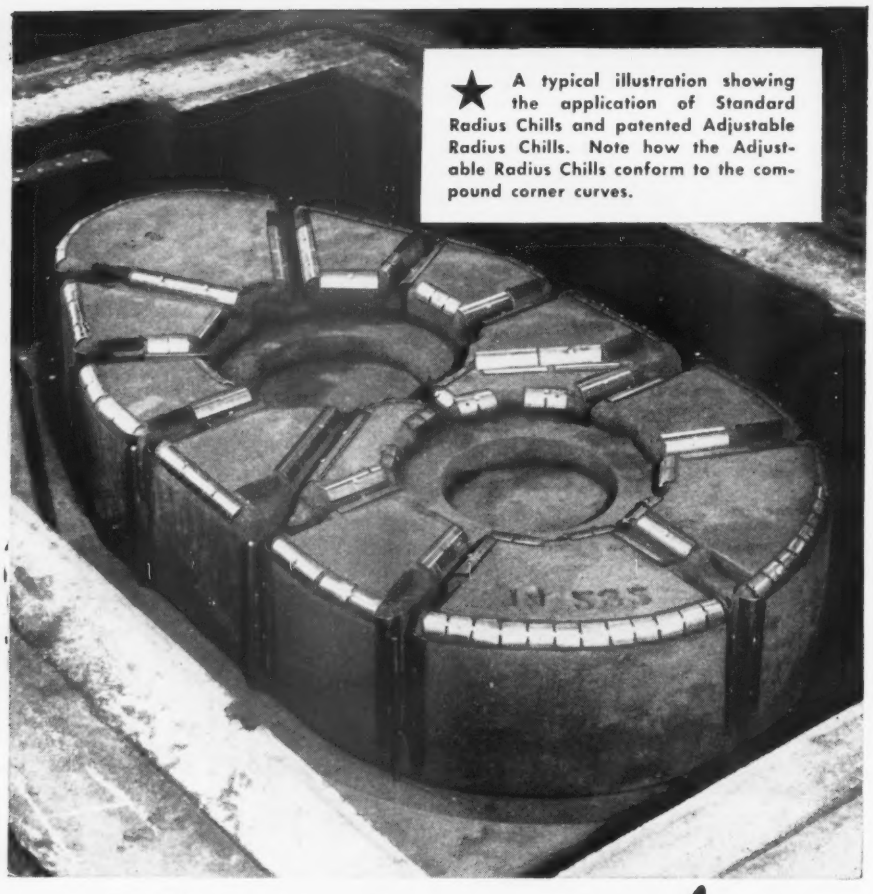

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there can be no coherence except that due to liquid surface tension and possible interlocking of the plastic solid dendrites.

Stress in the classic foundry sense does not enter into hot tear formation, only in widening and possibly propagating the rupture after complete solidification. With modern inspection techniques, the initial hot tear is of prime importance; how wide it becomes afterwards is of secondary importance.

There is no question but that the stress required to form hot tears is very low, for all investigators, as summarized in Fig. 5, show tensile strengths less than 50 psi within their hot tearing range. Again, temperature measuring techniques are probably responsible for the divergently reported absolute temperatures, but the relative temperatures for each investigation are reasonably accurate.

Doubts Data Based on Stress

The interdendritic liquid theory for hot tear initiation casts doubt as to the significance of all data based on stress, for if the rupture can be initiated at no stress, a loading mechanism cannot detect the initial rupture, only measure the stress required to widen the initial rupture. Regardless of the foregoing, restraint, whether imposed mechanically as reported by M. & P., or by sand as reported by other investigators, as summarized in Fig. 7, does cause hot tearing. There is universal agreement that changes in restraint can cause rupture or no rupture with the same test casting, all other factors held as constant as possible.

A significant observation has been reported by M. & P. They find that as the stiffness of the spring resisting contraction of their test casting is increased, the metal ruptures in shorter times, at higher temperatures, lower loads and with much lower elongation. These data are summarized in Fig. 8. There is a semi-quantitative relation of the same order of magnitude as decrease in pouring temperature between load and contraction before fracture and resistance to contraction at constant pouring temperature. In other words, hard cores or any other factors resisting contraction do not necessarily cause rupture by imposing stress in the classical sense, but indirectly by making the metal itself rupture at lower contraction values. The important variable in Fig. 8 is not the strength, but contraction before rupture.

If the above theory is valid, variations in resistance to contraction, as imposed by cores, need not be treated

as stress, but as one of the factors effecting strain concentration quantitatively as a constant in equations governing the position and shape of a series of curves like the tentative curve in Fig. 6. This curve is one for the particular sand used by Hall in his tests. A change in a constant would result in another curve that could lie above or below the curve shown. Another curve would fit the "collapsibility" of cement bonded sand, another positioned above the curve in Fig. 4 would fit the "collapsibility" of green sand as used with the writer's test casting.

Hall's test casting would be ideal for this work. The geometric hot spot enables a precise determination of strain concentration and relative cooling rates. It would then be possible to study sand "collapsibility," a factor that has eluded all investigators in the past. At the same time a slight change in gating or the omission of the brackets would enable a quantitative study of hot tearing tendency due to gating and metal flow and at junctions of sections. Both of these factors elude quantitative study by any of the older methods. A quantitative study of hot tearing at junctions of sections is particularly important, for most trouble in production occurs at such junctions.

Foundry Variables Affecting Hot Tearing—After the susceptibility to hot tearing is known, it is equally important to know what to do about it. Therefore, quantitative data as to the relative effect of the variables inducing hot tearing under the foundry's control is of prime importance. Practically nothing is known at present.

Since chills directly affect temperature gradients, one of the two major variables, there is little question but that chills are a major foundry variable for eliminating hot tearing. In fact, the potency of chills is the basis for much of the trouble the foundry encounters with them. First, metal chills have no collapsibility, and if there is any adherence the rate of load application is infinite, and from Fig. 8 rupture is immediate. A foolproof wash to prevent adherence is needed.

Fig. 6 emphasizes another common trouble with chills—overchilling. A metal chill will extract heat from steel at a rate about five times that of sand.[11] Fig. 6 shows that the relative cooling rate of a hot spot must be more than about 80 per cent of the contracting member to control hot tearing. If strain concentration is high, this ratio must be more precise; the hot spot must cool between 90 and 100 per cent of the

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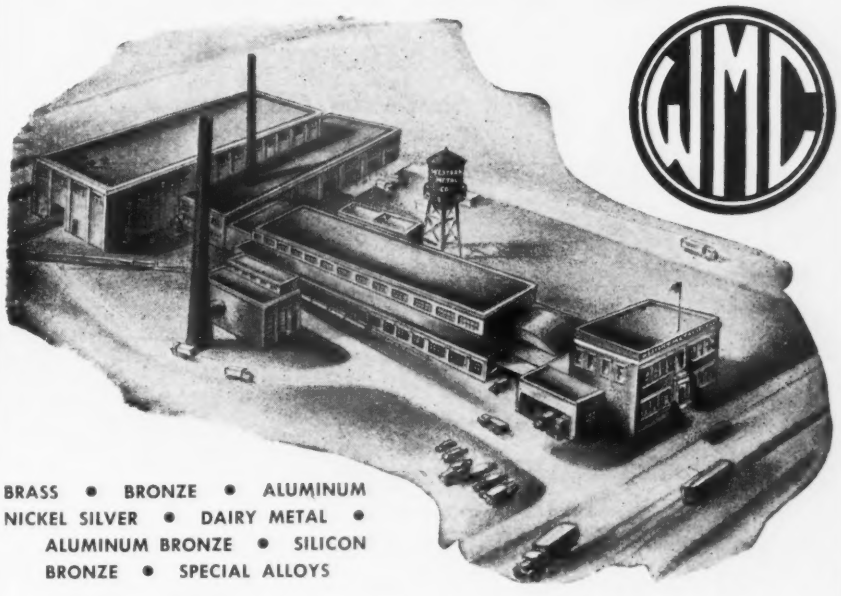

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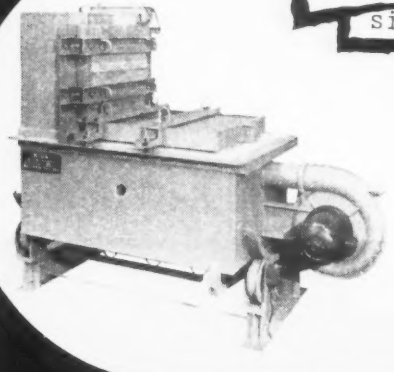

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rate of the contracting member. If a chill is introduced, so that the cooling rate of the hot spot is increased to between about 80 and 120 per cent of the contracting member, all well and good. However, the potential chill cooling rate can be as much as 500 per cent higher than that of sand and hot tears will form at the new hot spot. This has all the earmarks of the old foundry game of chasing the crack, a game where the casting plays with the foundryman.

Available data indicate that sand is the next most important foundry variable. Unfortunately, there is little formal proof. Probably one of the most convincing has been advanced by Rassenfoss. He finds many metal variables having a measurable effect on hot tearing of his test casting when a strong hard core is used. When undried molding sand is used, no hot tears occur under extreme variations in the metal.

Wyman, Faist and DiSylvestro also show extreme variations in hot tearing with changes in the sand, although no reason can be advanced as to why. Two important points are missing. The first is how important are sand variables in relation to the others affecting hot tearing—chills, brackets, gating, risering, metal variables. The second is what sand properties affect hot tearing. Wyman, Faist and DiSylvestro's results indicate that none of the sand tests used today has any bearing on hot tearing.

There has been investigational work reported on the effect of gating and risering, other than the effect of the slot gate of the AFS test casting, reported in references (5) and (6). It is quite possible that these two foundry variables are of equal or greater importance than sand and approach chills in importance, for they affect temperature gradients. Gating and risering may be the missing link in the proper understanding of hot tearing. In fact, they may be a whole chain.

In contrast to the paucity of data on the previous phases, there is a flood on metal variables. Unfortunately, the first reading leaves the impression of utter confusion and lack of agreement. It requires a lot of digging and perhaps some arbitrary rejection of some of the data before even a semblance of order can be obtained. The following summarizes the writer's interpretation of the metal results.

Metal Temperature (good agreement) — M. & P.[2] report a surprising increase in resistance to hot tearing with low pouring temperature. Rassenfoss checks M. & P.'s results, but to a lesser degree. This increase

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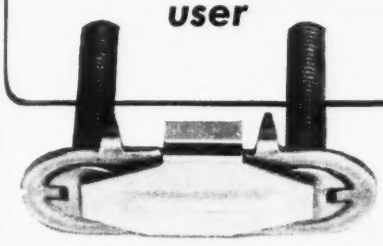

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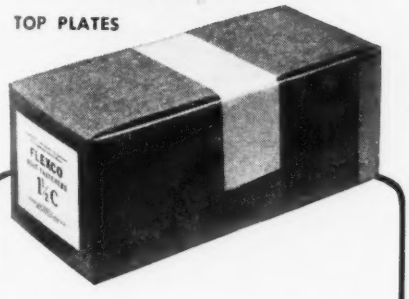

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in resistance to hot tearing is not at all surprising in the light of strain concentration, for M. & P. report much lower temperature gradients in their test casting at low pouring temperatures. As the strain concentration (Fig. 7) of Rassenfoss' casting is only about half that of M. & P.'s, the latter should show a greater quantitative difference.

Rassenfoss also reports a decrease in hot tearing with very high metal temperatures, probably due to core breakdown. This effect cannot be expected with M. & P.'s springs. Unfortunately, pouring temperature cannot be used in the foundry as much as the above would indicate. Both investigators report very little difference in hot tearing in the usual pouring range of 2850-2975°. Steel must be poured at close to 2800° F to appreciably increase its resistance to hot tearing. Metal temperatures this close to the liquidus restrict its use to large castings poured from bottom-pour ladles. Pouring temperatures high enough to cause appreciable core breakdown require furnace temperatures exceeding 3300°, too high for efficient melting furnace operation.

Carbon Content (fair agreement)—M. & P. report increased resistance to hot tearing with 15 per cent carbon steel as compared with .22 per cent. Rassenfoss reports similar results. However, M. & P. report a slight decrease in resistance to hot tearing when the carbon content is increased .40 per cent. Rassenfoss finds the opposite, a decrease in hot tearing at .45 per cent carbon, no hot tearing under the conditions of his test casting with carbon contents exceeding .65 per cent. Unfortunately carbon cannot be utilized by the foundry to any extent because of specifications.

Manganese Content (poor agreement)—M. & P. report only slight variation in deformation due to manganese contents between .50 and 2.5 per cent at 2910°, 2870° and 2780°. The curve for 2820° metal temperature fluctuates wildly and is questionable. See appendix for details. Rassenfoss reports a steady decrease in hot tears as the manganese content and manganese-sulphur ratio increase.

Sulphur (good agreement)—M. & P, B. A. & P. and Rassenfoss all report an increase in hot tearing with increasing sulphur. Again it is unfortunate that the sulphur content must be decreased to very low values, below .025 per cent, before an appreciable increase in resistance to hot tearing is obtained. Except at the extremes of the range for sulphur, it seems that this variable is rela-

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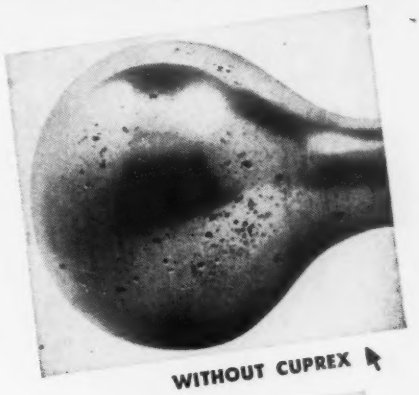

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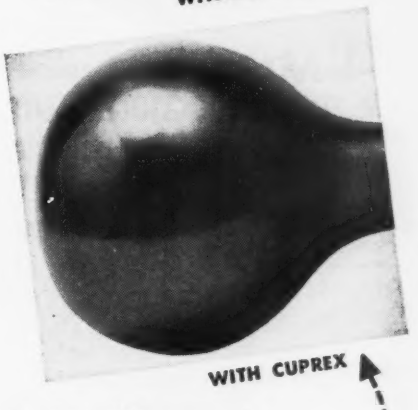

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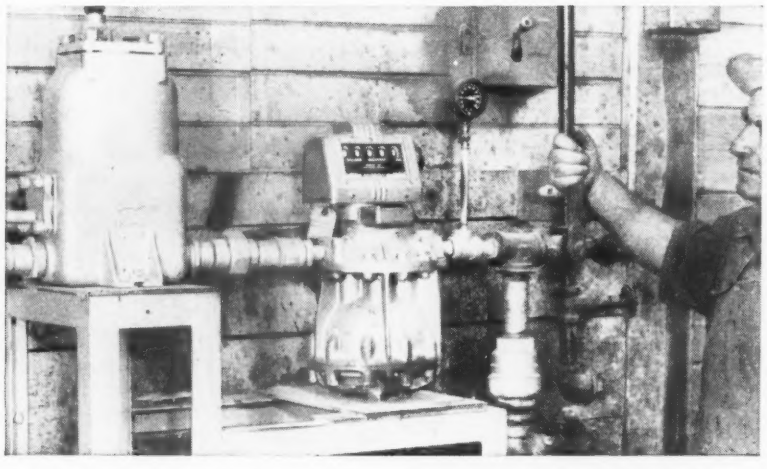

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tively minor in nature.

Phosphorus (poor agreement)—M. & P. report no significant difference in hot tearing due to phosphorus variations between .03 and .07 per cent. B. A. & P. report an increase in hot tearing as the phosphorus increases to .07 per cent in the order of about half that of sulphur. Perhaps the reason for the discrepancy is that phosphorus is a relatively minor variable.

Deoxidation (good agreement)—Both M. & P. and B. A. & P. report an increase in resistance to hot tearing with steels properly deoxidized with aluminum. M. & P. also report a minor increase in hot tearing when the steel contains Type II sulphide strings. Rassenfoss reports an increase in the number of tiny hot tears when Type II sulphide strings are present. Perhaps the change in number of ruptures does not show up with M. & P.'s loading mechanism.

M. & P. also report an increase in resistance to hot tearing with titanium and vanadium, but the amount needed is much greater than with aluminum and above that usually added to carbon and low alloy steels. It is significant that aluminum, titanium and vanadium all promote small as-cast grain size. Small grains with short confused dendrites would not offer the opportunity for strain concentration as would the coarser dendrites of silicon killed steels.

Cu, Ni, Si, Cr, Mo—M. & P. report the effect of these alloys in the ranges usual in carbon and low alloy steel to be minor, except as they affect the freezing temperature and increase superheat at any given pouring temperature. There are no checks by other investigators in the literature.

Appendix—Since the work of Middleton and Protheroe is very good and is not usually available to the steel foundryman in this country, the details of their study of metal variables are summarized in Figs. 9 to 20. A few limitations of these data must be emphasized. M. & P.'s work has one great advantage, simplicity, in that it bypasses all sand variables and reports only the metal variables. At the same time, because of this simplification the results cannot be applied directly to foundry problems. An example is metal temperature. M. & P.'s results do not take into consideration the effect on the metal temperature of the sand.

These charts are self explanatory and only two comments are in order. The wild gyrations of the 2820° line in most charts is, to the writer, due to slight errors in relative tem-

perature measurements. All indications are that the resistance to rupture of most steels increases greatly at about 2820° and that a difference of say 10° at this point can cause differences of 100 per cent or more in resistance to contraction.

The abrupt decrease in resistance to rupture, particularly at 2780° with higher alloy contents is probably due to lowering of the freezing range by the alloy. If metal is tapped in the foundry on freeze count, this variable is automatically compensated.

Resistance to rupture in Figs. 9 to 20 is plotted as strain (contraction) before rupture, in keeping with the theme of this article. If the reader prefers stress rather than strain, conversion can be made by multiplying by 10,000 to give stress in pounds. The spring used imposed a load of 10 lb for each .001-in. deflection.

The temperatures shown in the accompanying charts are metal temperatures of the casting at the point of hot tearing. They may be low, as discussed in the first part of this article.

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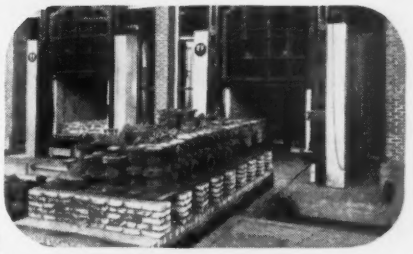

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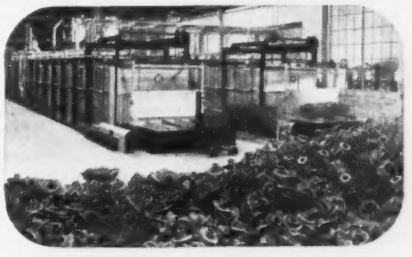

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WELDING: Arcos Corp., 1500 South 50th St., Philadelphia 43—Booklet containing technical information on the welding of stainless, low-alloy and high-tensile steels and nonferrous metals is a guide and index to a series of bulletins, charts and articles prepared as working tools to facilitate welding and aid those responsible for plant welding practices.

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INDUSTRIAL LUBRICANTS: Pure Oil Co., Advertising Dept., 35 East Wacker Drive, Chicago 1 — Booklet sets up six simple steps to streamline lubrication programs and points out that for the average plant, a maximum of six lubricants is sufficient.

For More Details Circle No. 118—Page 259

SAFETY AIDS: National Safety Council, 425 North Michigan Ave., Chicago 11—Service guide 2.1 brings together in one catalog information on all of the council's current materials and services, including publications, films, posters, training aids and similar accident prevention aids.

For More Details Circle No. 119—Page 259

CORROSION PREVENTION: Paramount Industrial Products Co., University Center Station, Cleveland 6—Bulletin L-6976 describes paints that are said to stop rust in one application, without surface preparation of any kind.

For More Details Circle No. 120—Page 259

PNEUMATIC CONVEYING: Convair Corp., 4156 Library Rd., Pittsburgh—Bulletin 104 offers information on types of pneumatic conveying systems available and shows applications.

For More Details Circle No. 121—Page 259

MATERIALS HANDLING: Lewis-Shepard, Watertown, Mass.—May, 1953, issue of the *Lever*, the company's magazine, reviews the firm's line of hand and electric trucks.

For More Details Circle No. 122—Page 259

SHELL MOLDING MACHINE: Shell Process Inc., McKinstry Ave., Chicopee, Mass.—Illustrated booklet describes step-by-step operation of fully automatic shell molding machine and gives specifications.

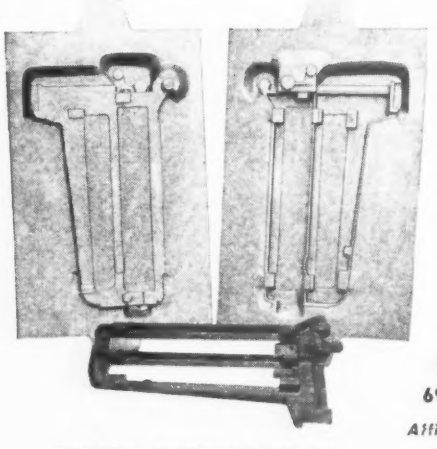
For More Details Circle No. 123—Page 259

MIXING LADLES: Monometer Mfg. Co., Savoy House, 115/116 Strand, London, W. C. 2, England—Booklet describes oil and gas-fired

MORE CASTINGS AT LESS COST

with PRESSURE-CAST ALUMINUM

MATCHPLATES and COPE & DRAG PLATES



Good castings from good matchplates or cope & drag plates. PPC will make plates with smooth finish, accurate partings and absolutely proper alignment to speed your production with accuracy. Always get quotations first from PPC.

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PRESSURE-CAST MATCHPLATES COPE & DRAG PLATES

hot metal receivers for the intermittent feeding of ladles to supply molten iron at 2700°F. Illustrations and pertinent information are included.

For More Details Circle No. 124—Page 259

EXHAUST UNITS: M & E Mfg. Co., 2571 Winthrop Ave., Indianapolis 5—Booklet F-52 pictures the company's heavy duty exhaust units and gives application data, performance ratings, dimensional specifications and other pertinent information, including descriptions of accessory equipment.

For More Details Circle No. 125—Page 259

BRUSHES: Torrington Brush Works, 104 Calhoun St., Torrington, Conn.—Catalog 30 lists and illustrates over 400 brushes of all sizes and types, for industrial and institutional use.

For More Details Circle No. 126—Page 259

CONVEYORS: Honan-Crane Corp., 656 Wabash Ave., Lebanon, Ind.—Catalog 803 is a colorful plastic-bound booklet which contains illustrated descriptions of conveyors for continuous, automatic removal of metalworking chips, scale, sludge, cracklings, powders, grain and similar materials. Technical data, case histories and installation and operating instructions are included. Write on company letterhead for free copy.

For More Details Circle No. 127—Page 259

BLAST CLEANING: American Wheelabrator & Equipment Corp., 1102 South Byrkit St., Mishawaka, Ind.—Bulletin 924 relates a number of case histories to show how airless blasting can be used in cleaning rooms in malleable foundries to effect considerable savings. Various types and models of airless blast cleaning equipment are illustrated.

For More Details Circle No. 128—Page 259

ABRASIVES: Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37—Form ESA-23 contains illustrations and descriptive data concerning all standard sizes and shapes of abrasive rubbing bricks, abrasive and dresser sticks and scythe, jointer, sharpening and specialty stones.

For More Details Circle No. 129—Page 259

ROOF MAINTENANCE: Monroe Co., 10703 Quebec Ave., Cleveland 6—Brochure on the importance of proper roof maintenance explains what constitutes a good roof coating and compares the life of various types of cold process roof preservative compounds.

For More Details Circle No. 130—Page 259

DYNAMOMETERS & TESTERS: W. C. Dillon & Co., 14620 Keswick St., Van Nuys, Calif.—Bulletins D42, and LR2 describe the organization's dynamometer, universal tester and multiflow-range universal tester. Con-

Another Foundry using DUREZ Resins reports...

"SHELL MOLDING PAYS"

Benefits worth checking

- Dense, rigid molds
- Minimum cycle time
- High bonding strength
- Accurate dimensions
- Smooth surfaces
- Minimum cleaning
- High output per man

Complete success in shell molding with automatic machines covers far more than man-power economy. The molds themselves must cure fast, set rigid, and produce castings having a pattern-like finish with smooth contours and clear definition. This minimizes cleaning up.

Using Durez phenolic resins, Production Pattern & Foundry Co. gets these results. Note the finish of this casting as it comes from the mold. It emphasizes the advantage of using resins developed for foundry operations by specialists.

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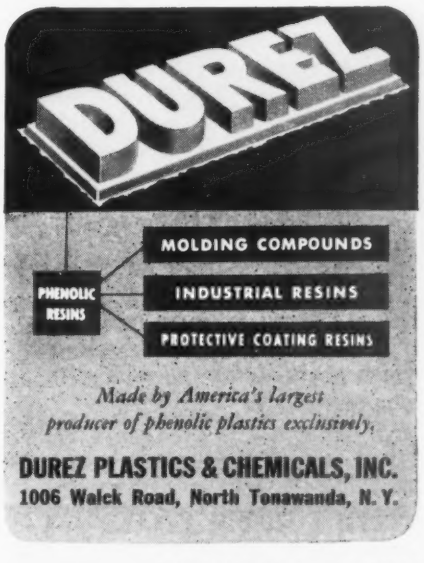

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Send me information on the shell molding process.

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Company .....

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PHENOLIC RESINS THAT FIT THE JOB

Save money *with* TAMASTONE

400%

INCREASE IN PRODUCTION

WITH THIS MATCH PLATE

Photo courtesy of Supreme Brass & Aluminum Foundry, Los Angeles, Calif.

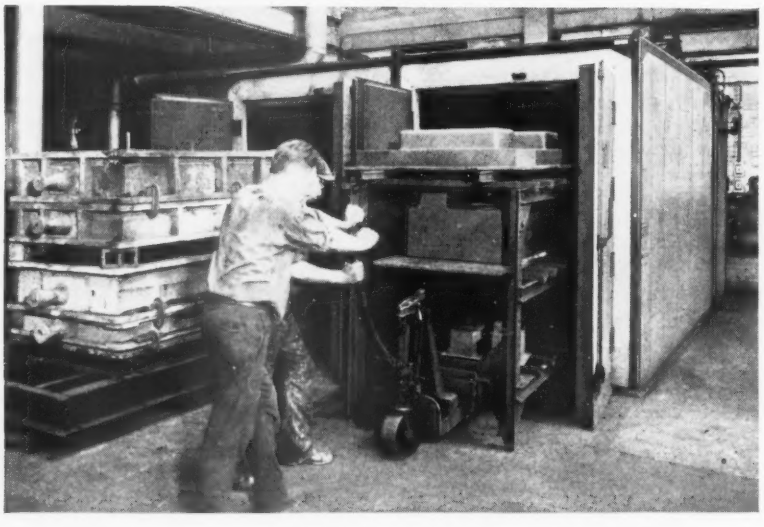
Shown here is a match plate converted from 3 loose patterns through the use of Tamastone Pattern Compound. A typical method which will enable a foundry to turn out from 600 to 1000 molds or more. Your men can make this pattern equipment right in your own foundry at a minimum of cost.

Check your loose and metal gated pattern equipment now!

TAMMS INDUSTRIES, INC.

228 N. La Salle St., Chicago 1, Ill.

Recirculation Heating Produces More Uniformly Dried Cores



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Stronger and more uniform cores are baked in Gehnrich Ovens, batch or conveyor type, heated by recirculating hot gases.

W. S. ROCKWELL COMPANY

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tents include descriptions of features; photographs of instruments in use illustrating applications; revised price structure and other information.

For More Details Circle No. 131—Page 259

BRONZE WELDING RODS: Titan Metal Mfg. Co., Bellefonte, Pa.—Folder outlines and discusses chemical and physical properties of the company's bronze welding rods. It shows the ASTM, AWS, Federal and Navy specifications the rods meet, recommends uses and applications for specific alloys and points out how the firm's laboratory control methods contribute to quality products.

For More Details Circle No. 132—Page 259

SAFETY POSTER: Willson Products Inc., Reading, Pa.—Four-color poster BM-13 pictures a man reading a magazine on the left and a facsimile page of the Braille edition of the

magazine being "read" by hands on the right. Headline asks "Which way would *you* rather read?" and the subhead says "Wear your safety goggles." Poster is 11-¾ x 15 in.

For More Details Circle No. 133—Page 259

INDUSTRIAL HEATERS: Westinghouse Sturtevant Division, Dept. T-025, 200 Readville St., Hyde Park, Boston 36—Catalog 1510 discusses use of standard and heavy-duty, centrifugal fan, industrial heaters. Tables and graphs of performance data, outline dimensions of units and other information are given.

For More Details Circle No. 134—Page 259

SALES PRESENTATIONS: Remington Rand Inc., 315 Fourth Ave., New York 10—Folder LL-225 explains how to make effective, interesting sales presentations. Suggestions are based on organizing facts, pictures, prices and other data that make up a visual and oral "best sales story."

For More Details Circle No. 135—Page 259

DUST COLLECTOR: Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Bulletin 915 concerns engineering features of a self-cleaning, cloth screen dust collector which uses the principle of reverse air flow for continuous cleaning of cloth filters.

For More Details Circle No. 136—Page 259

BELTING: B. F. Goodrich Co., Akron, O.—Manual on installation and maintenance of conveyor and elevator belting contains more than 60 photographs and drawings illus-

trating ways to improve belt service and length belt life. One chapter is devoted to belt selection. A table lists common conveyor belt maintenance problems, their causes and remedies.

For More Details Circle No. 137—Page 259

ELECTRONIC SCALE: Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Wayne & Windrim Aves., Philadelphia 44—Instrumentation data sheet 10.18-2 describes an electronic scale that employs the servo technique for industrial weighing. The sheet explains the operations and application of the equipment for cranes, platforms, railroad tracks and other locations.

For More Details Circle No. 138—Page 259

ELECTRODES: McKay Co., 326 McKay Bldg., Pittsburgh 22—Series of bulletins designed to assist in electrode selection gives complete details on operation and usability of each grade of a new line of hard surfacing electrodes. These electrodes are made with a low-hydrogen type coating. Specifications, chemical analysis, mechanical properties, applications and other essential data are presented.

For More Details Circle No. 139—Page 259

ELECTRIC HEATING: General Electric Co., Schenectady 5, N. Y.—Catalog GEC-1005D contains 175 photographs and drawings illustrating immersion, strip, cartridge, tubular, insertion and fin heaters; melting pots; thermostats; switches; oven heaters and induction heaters, all of which are described in terms of applications, special features, installation and pricing.

For More Details Circle No. 140—Page 259

METER: Simplex Valve & Meter Co., 68th & Upland Sts., Philadelphia 42—Bulletin 401 concerns mercury flow type indicating, recording and totalizing meter for the measurement of water, gas, air, sewage, sludge or other industrial liquors. Description includes facts on operation, construction, sizes and capacities, specifications and other information.

For More Details Circle No. 141—Page 259

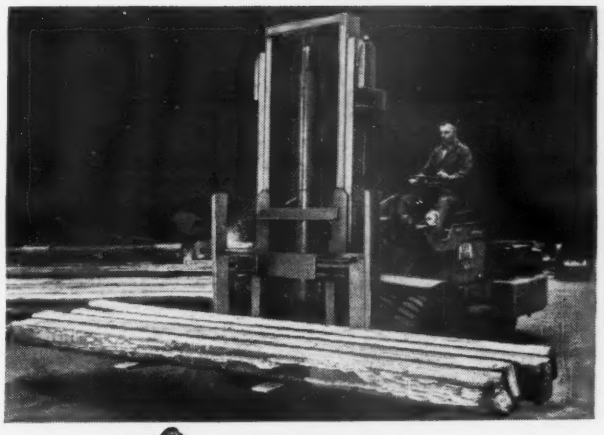
PNEUMATIC HANDLING: Yeomans Brothers Co., 1999 North Ruby St., Melrose Park, Ill.—Bulletin 4501 contains case histories of pneumatic ejector handling installations in foundry and other applications. System uses pipe lines to transport core and green sand.

For More Details Circle No. 142—Page 259

V-BELTS: Raybestos-Manhattan Inc., Manhattan Rubber Division, Passaic, N. J.—Fractional horsepower V-belt catalog for use in servicing light-duty applications lists belts according to the new industry-standard numbering system.

For More Details Circle No. 143—Page 259

HEAVY INDUSTRY HARNESSES HEAVY-DUTY FORK LIFTRUK ON THE PRODUCTION LINE!



Here you see a LIFTRUK in *The Timken Roller Bearing Company* plant, Canton, Ohio, carrying a load of blooms. This is but one of hundreds of important movements required of a LIFTRUK in the metal-production fields.

LIFTRUKS are available in 5 - 7½ - 10 - 15 Ton capacities. Larger sizes to order.

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LIFTRUK features = 1—Rugged dead axle for traction wheels. 2—Extra large elevating hydraulic cylinders. 3—Oversize engine clutch. 4—Generous sturdy construction of tiering frames and fork apron—these and other LIFTRUK features assure you of production materials handling and elimination of shut downs or slow ups.

Let our sales engineers give convincing proof of LIFTRUK performance to meet *your* specific needs.

Also available with Boom, Ram, Scoop and other attachments.

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BONDING CLAYS
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Tru-Steel Steel Shot
*Certified Shot and Grit
*Malleabrasive Shot and Grit
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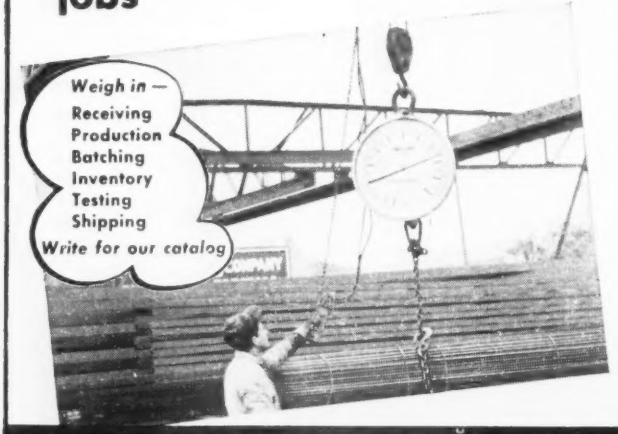

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Water cooled molds can be maintained at either high or low temperature easily. High or limited production in very small space with unskilled labor. Completely safe for workmen. Simple, sturdy equipment. Quick changeover from one mold to another. Practically 100% metal yield of high quality, denser castings. Metal porosity eliminated.

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DANDUX belts are built specifically *for the job and its temperature range.* For unexcelled performance, for belts built to the highest standards of quality, you'll want to know more about Dandux *Pyroflex, Insulex* and *Double Insulex* hot belts . . .

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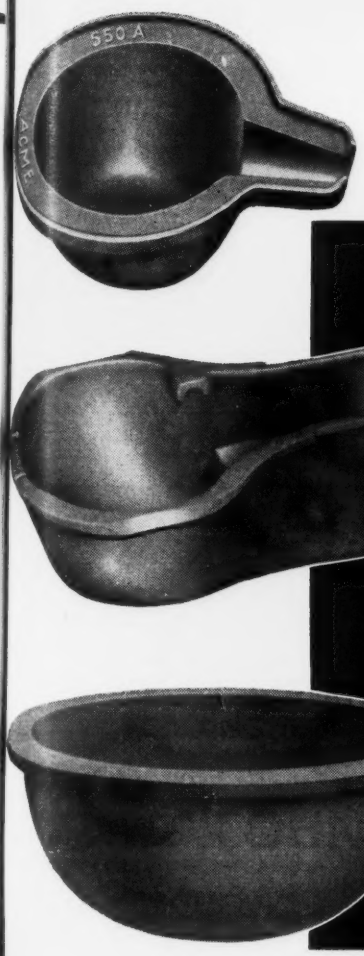

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They are simple to feed into ladle or cupola, save time and cut labor costs. Soda Briquettes are dustless, which eliminates waste and improves working conditions.

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CLEVELAND *Coil Head Shoulder Radiator Chaplet*

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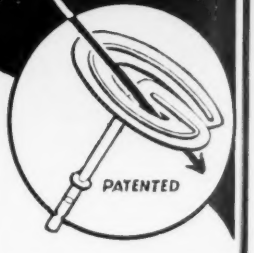

REDUCES CASTING REJECTS

Core support failures are minimized because you can pack sand better under head and around stem of this chaplet.

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COLOR YOUR CORE SANDS

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Our laboratories have developed a line of special dyes in a range of colors that have been carefully tested and found suitable as well as economical.

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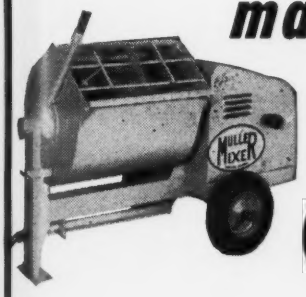
BETTER CORES *make* BETTER CASTINGS



You can save time and money and make better cores with the Muller New 3½ Cubic Foot Core Sand Mixer. It mixes 250-300 pounds per batch. Better cores mean better castings. This new, labor-saving Core Sand Mixer will "buy itself" out of savings in a short time.

PRICE: $344.00 complete with 1½ H. P. Electric Motor ready to plug in, F. O. B. Metuchen, New Jersey.

This Mixer is also available in 6, 6 to 8, and 9 Cubic Foot sizes.

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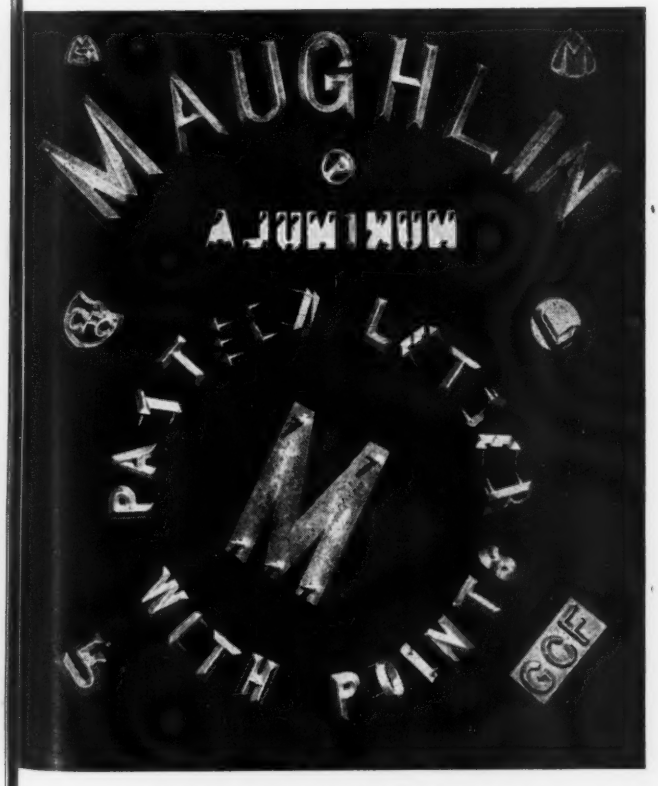
A Hammer Blow Secures Letters To Pattern



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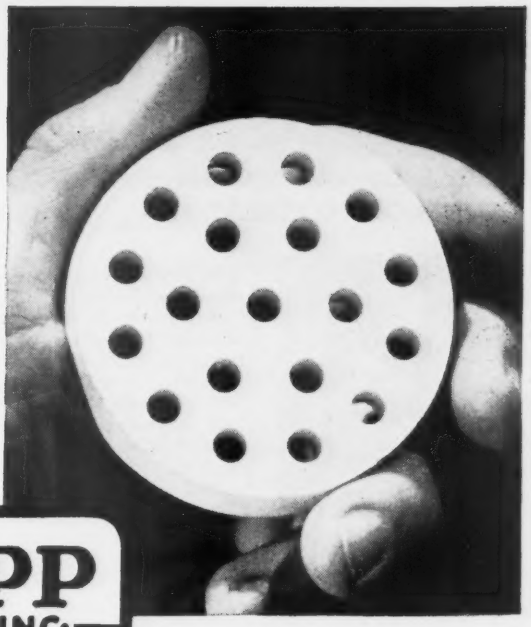

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A *few cents* invested in genuine Porcelain Products Ceramic Strainer Cores *can save you dollars in production costs!*

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- Economical to use . . . pay for themselves.
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Help Solve Your Rehandling Problems for Average or Unusual Conditions

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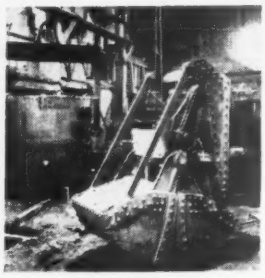

THERE is a type and size of Blaw-Knox Single-Line Hook-On Foundry Buckets to meet a wide range of operating conditions. Blaw-Knox can best give you the competent engineering service that makes possible selection of the bucket suited to your needs.

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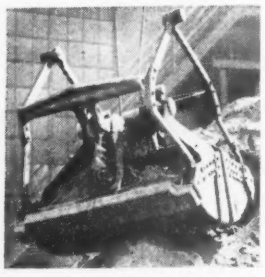
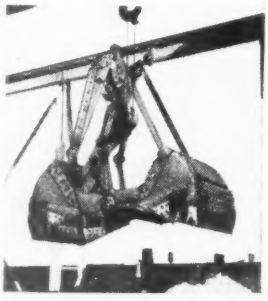


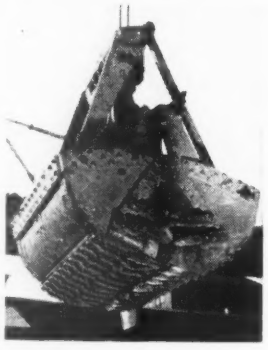
THIS Single-Line Hook-On Bucket solves rehandling problems when headroom is extremely limited. The ¾ yd. capacity bucket requires only 6'7" operating headroom. Also available in larger sizes.

FOR COKE AND SAND
"Shark Tooth" Single-Line Hook-On Buckets

HERE'S the answer to the problem of handling coke and sand . . . simply by adding or removing liner plates, the *same* dual purpose Blaw-Knox Bucket handles both, with minimum degradation of coke and without sand leakage! The illustration at the upper right shows an open head type Single-Line Hook-On Bucket, rated 1 cubic yard, with liner plates applied inside of the shark teeth for handling sand, coal, small limestone and granular fines. Illustrated at the right is a closed head type 1 cubic yard Shark Tooth Bucket without liner plates for coke handling.

Blaw-Knox Shark Tooth Buckets are available in a wide range of sizes and for different headroom conditions.





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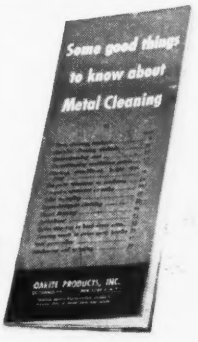

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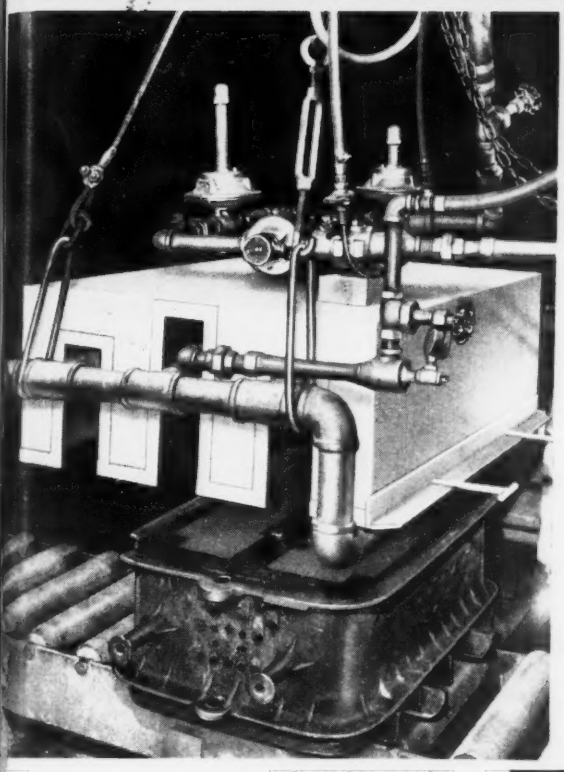

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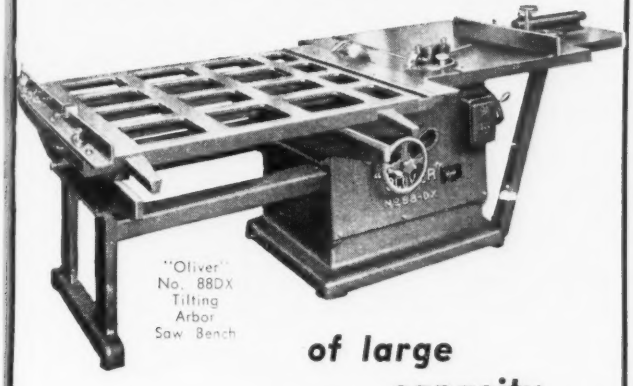

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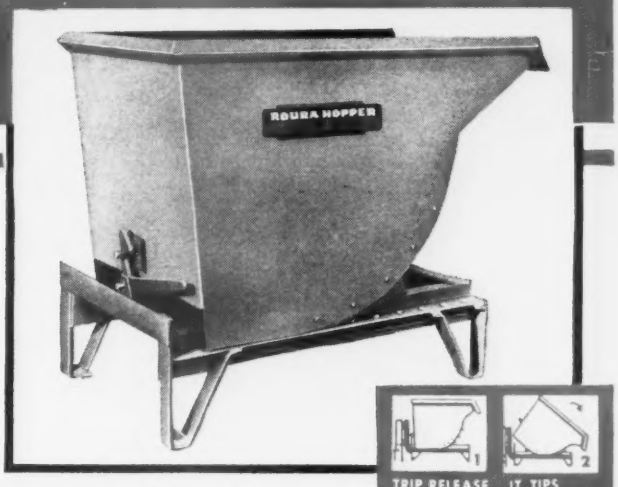

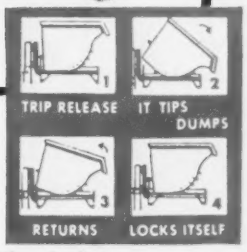

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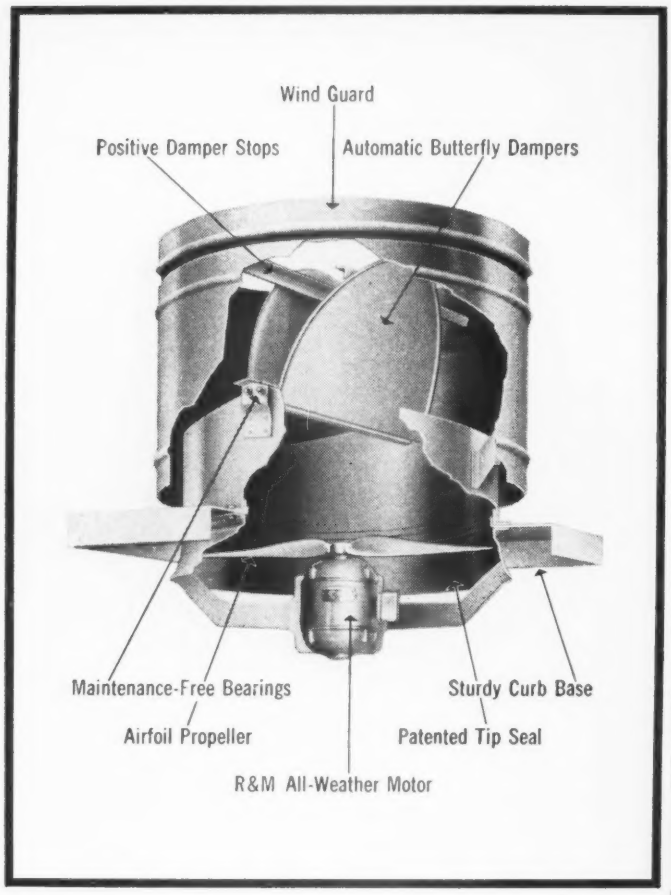

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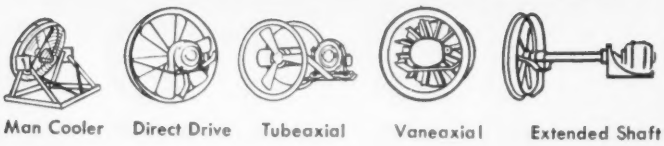

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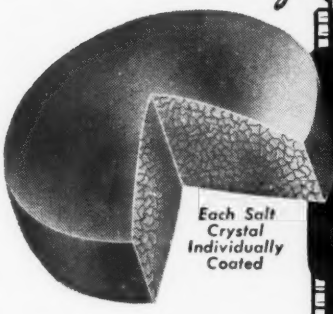

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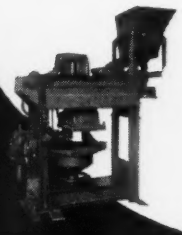

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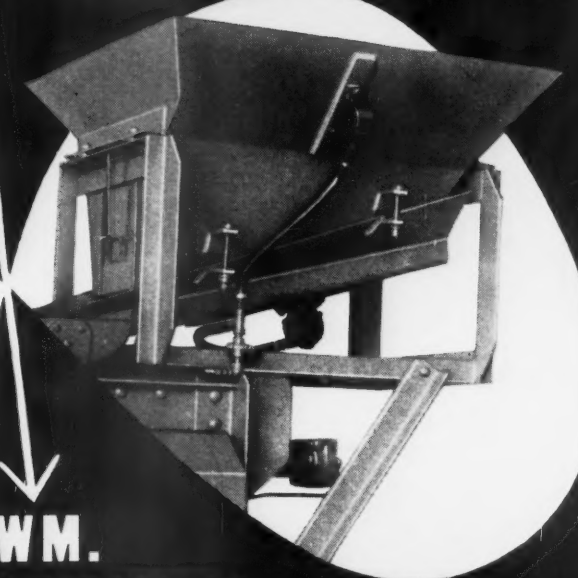

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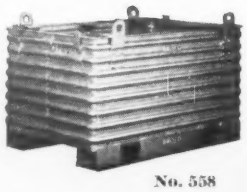

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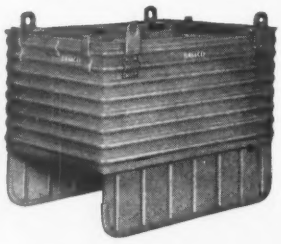

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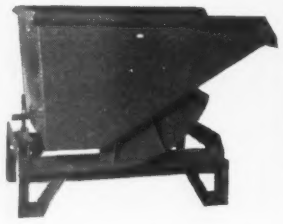

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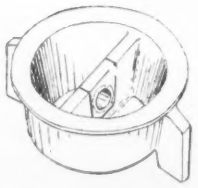

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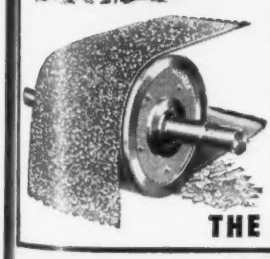

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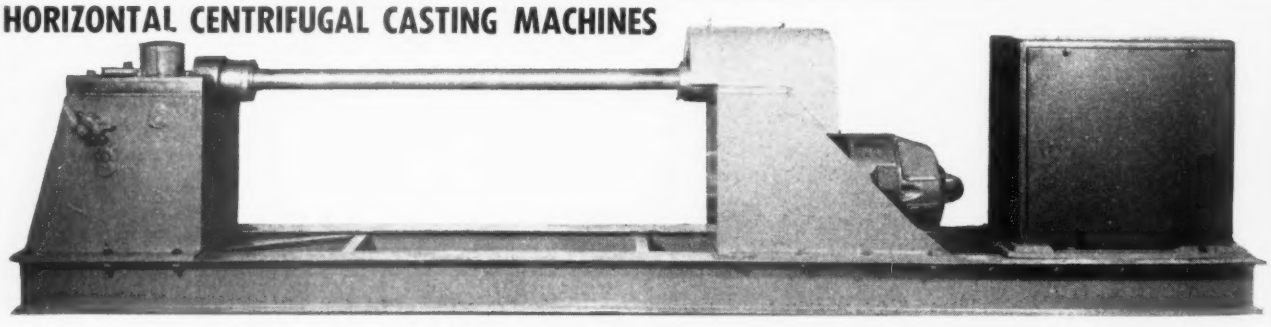

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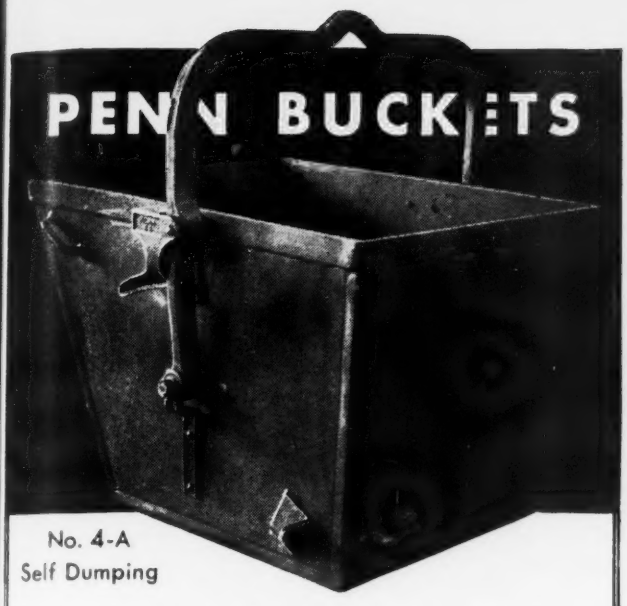

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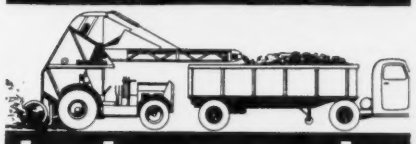

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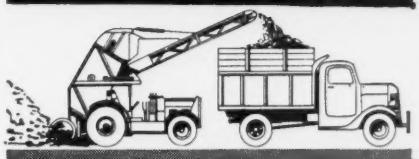

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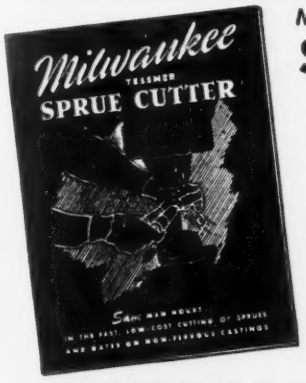

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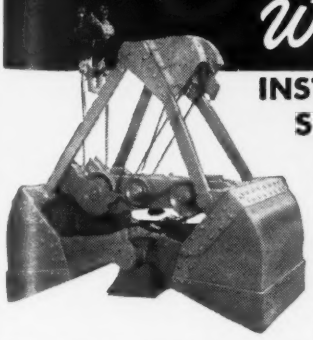

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Capacities from ⅜ to 2 cubic yards. Write for free bulletin.

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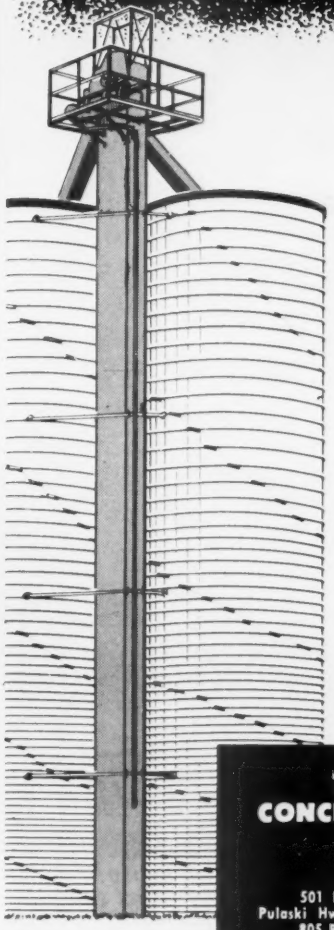
store core sand right... in MARIETTA CONCRETE SILOS



Make more efficient use of foundry floor space! Relocate sand storage in modern MARIETTA concrete stave silos. These silos take valuable core sand off the floor, outside the building, and put it up in the air, out of the way where it is always readily accessible. MARIETTA silos protect sand from moisture and freezing, keep it in a ready-to-use condition, give better inventory control When equipped with mechanical loaders and unloaders, they can cut handling costs to a low 4c per hp, from $10 per hp for manual labor. Write for MARIETTA industrial silo information New catalog available.

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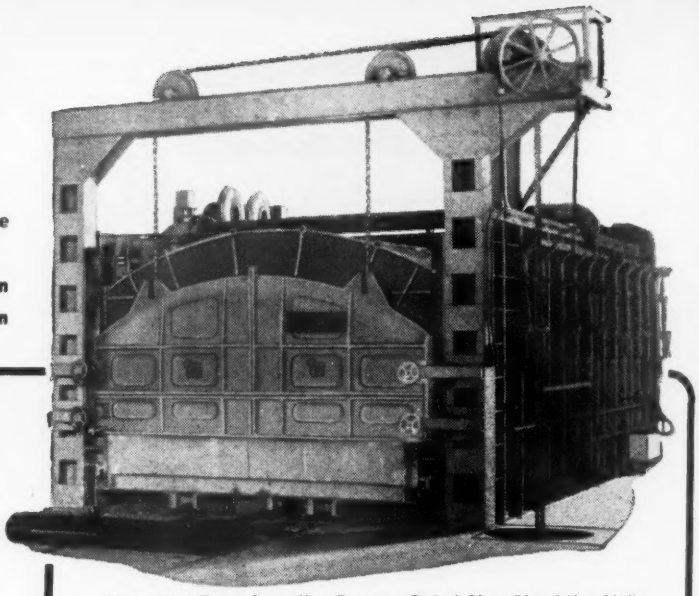
● Faster heat ● Wider temperature range ● More uniform heat penetration ● Lower operating costs ● More rugged construction for longer service life ● Over 40 years experience in furnace building



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WRITE for Equipment Bulletin No. 200. Specifications cover 23 rated sizes from 4' x 6' x 2' to 9' x 20' x 4'6". Complete information supplied promptly on any other size.

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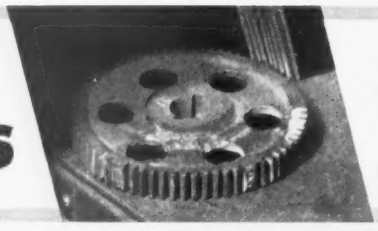

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Cast or Malleable Iron Machineable . . . without Preheating

Worth its weight in gold for repairing defective castings, castings sand pockets, machining errors, etc.

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CO-LOIDAL-AC Lacquer is a one-coat finish that dries fast. It gives a hard, long-wearing surface that eliminates sticking. It's easy to apply and never settles in the can.

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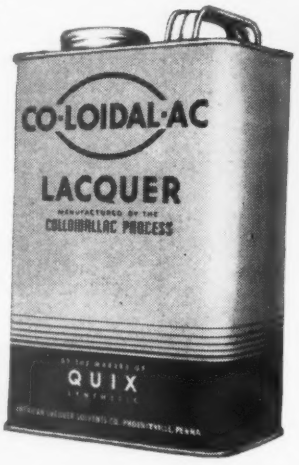

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"How To Use The Cupola" . . . 13 idea-packed chapters based on the practical experience of a man who has devoted his life to foundry fuel and melting problems.

It's a mighty useful handbook—a handy source of information which will pay for itself many times over in the months and years ahead.

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Problems?

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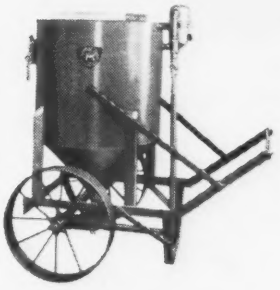
ABRASIVE BLAST EQUIPMENT

M

BLAST CLEANING MACHINES



A complete line of direct pressure blast hose machines in a wide range of capacities. Portable or stationary types. Designed for blast cleaning difficult work where speed and strong abrasive action are required.

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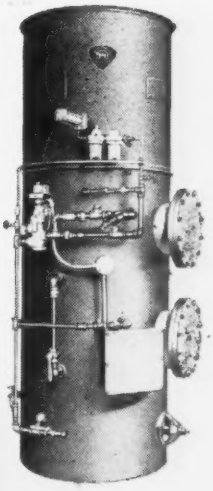
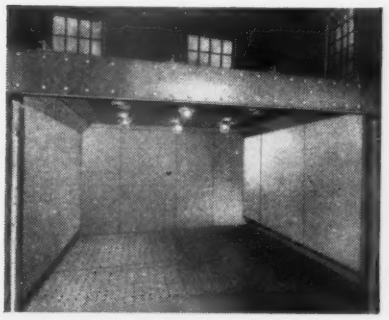
A double-chamber machine with a continuous, completely automatic blasting cycle. No shutdown time for reloading. Can be used with blast rooms, cabinets, tables, barrels, or special automatic devices.





MACLEOD BLAST ROOMS

Designed for use with Macleod automatic, semi-automatic, or manual blast cleaning machines. Available in standard or special sizes.

MACLEOD BLACKING SWAB SPRAYERS

Especially designed for foundry use. Work on suction principle and require compressed air to operate. Spray liquid facing on dry sand molds or oil on dry sand cores. Made in steel, brass, and copper, and in four sizes—1½ to 5 quart capacities.

For descriptive literature write Dept. F

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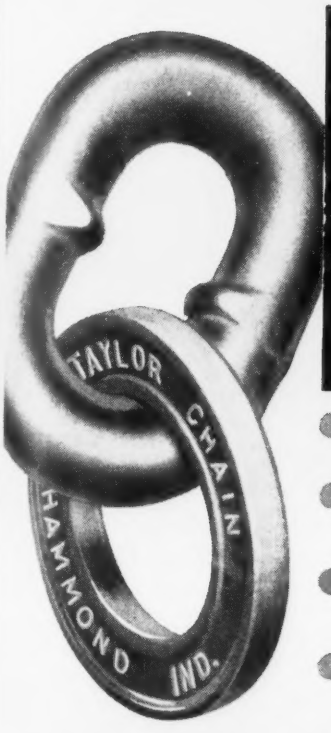
BOX 452, SHARONVILLE, OHIO ESTABLISHED 1897



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TM Alloy Steel Chain has twice the strength of wrought iron chain!

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On a size for size basis TM Alloy Steel Chain has twice the safety factor of wrought iron chain!

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This famous chain lasts five to fifteen times longer than wrought iron chain!

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CLASSIFIED ADVERTISING

Help Wanted

GENERAL FOUNDRY FOREMAN

For a malleable iron jobbing foundry located in the East. Excellent opportunity for a man now employed below his top capabilities. Give complete record of education, experience, age, draft status, salary expected, and how soon available. All replies confidential.

BOX 627

FOUNDRY CLEVELAND 13, OHIO

JOURNEYMEN COREMAKERS AND MOLDERS

Must be thoroughly experienced for progressive shop. Expansion of large, modern Aluminum-Magnesium foundry in Southeastern Pennsylvania offers opportunity to advance. Steady 50 hour week, night or day work—10c hr. extra for night. Housing or rooms available. Usual employee benefits. Union shop. Send complete resume.

BOX 658

FOUNDRY CLEVELAND 13, OHIO

PATTERN SHOP FOREMAN

Experience in steel foundry practice desirable but not essential. In replying give complete information which will be held in strict confidence by a single executive. Address: Box 616, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

PATTERN SHOP FOREMAN

For new well-equipped shop, ten to twelve men, old established Eastern Pennsylvania malleable foundry.

To supervise making ACCURATE wood and metal patterns, plaster and master patterns, sand cast matchplates and core boxes used on core blowers.

Excellent opportunity to improve your earnings and live in a very desirable community.

Write complete history and approximate salary desired.

BOX 667

FOUNDRY CLEVELAND 13, OHIO

STEEL FOUNDRY SUPERINTENDENT

For Midwest electric steel foundry producing approximately 175 tons of jobbing castings per month. Must have practical experience especially with loose pattern molding. Write full details of experience, personal information and salary expected. All replies confidential. Address: Box 670, FOUNDRY, Cleveland 13, Ohio.

WANTED

Man to take charge of sales program for malleable iron foundry. Must have actual sales and administrative experience in this or kindred fields. Address: Box 614, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERINTENDENT

For completely mechanized Eastern foundry. Experienced in all phases of core blowing, sand control and establishing production standards. State age, experience and salary requirement. Address: Box 649, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

List past experience and also state salary expected in first letter. Must be familiar with foundry work. Address: Box 583, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

FOUNDRY MANAGER

TO DIRECT OPERATIONS OF MODERN MECHANIZED FOUNDRY LOCATED IN OHIO. LIGHT WEIGHT PRODUCTION TYPE GRAY IRON CORED CASTINGS. DAILY MELT 100 TONS. TECHNICAL KNOWLEDGE REQUIRED OF CORE ROOM, CUPOLA AND MECHANICAL MOLDING OPERATION USING SYNTHETIC SAND. SUBMIT DATA COVERING EXPERIENCE, EDUCATION, AGE, REFERENCES AND SALARY DESIRED

BOX 653

FOUNDRY CLEVELAND 13, OHIO

FOUNDRY SUPERVISOR

Qualified foundry supervisor, experienced in all operations of gray iron foundry. Must be familiar with progressive foundry techniques. State qualifications and salary expected. Location: Southwest.

BOX 660

FOUNDRY CLEVELAND 13, OHIO

FOREMAN

Working foreman for foundry. Excellent opportunity in Northwest area. Should have experience in nonferrous metals. Permanent mold experience helpful. State all information in first letter. Address: Box 639, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

METALLURGISTS

The Los Alamos Scientific Laboratory of the University of California invites inquiries from qualified metallurgists interested in the following openings.

1. Opening in specialized foundry work. Vacuum and air melting, variety of metals; work is of a development nature. Willing to train new B.S. Metallurgy or Mechanical Engineers.

2. Metallurgist for development work on metal fabrication problems. Well equipped development laboratory. Some experience with metal fabrication problems desirable but not essential.

3. Welding engineer to assume responsibility for development program on welding and brazing of special materials. Should have sound background in both theory and practice of various types of welding and familiar with all welding equipment. B.S. in Metallurgy preferred but not essential.

APPLY TO PERSONNEL DEPARTMENT
LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
P.O. BOX 1663
LOS ALAMOS, NEW MEXICO

FOUNDRY SUPERINTENDENT WANTED

Good opportunity for man with all-around experience in iron and steel foundry to take complete charge of Coremaking, Molding, Melting, and Cleaning Sections. Applicant should have experience with pressure castings.

This is a permanent position with a well-rated manufacturer located in Southwestern Ohio.

Reply will be treated in confidence. Submit complete resume including experience, education, age and approximate salary requirements.

BOX 674
FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRY FOREMAN

Brass, bronze and aluminum castings. Location: Central East Coast. An old established nonferrous foundry of ten to twelve molders, in the jobbing field with a considerable part of its production in the more difficult alloys, is presently revamping its production control system and anticipates a change in personnel.
A man with technical or metallurgical knowledge and practical experience in foundry direction and training is required; not over 40 to 45 years of age is preferred.

BOX 645
FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRY SUPERVISORY PERSONNEL

Qualified foreman for all operations in highly mechanized, established malleable foundry. Positions open immediately. Must be familiar with progressive foundry techniques. State qualifications. Located: Midwest.

BOX 533
FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRY SUPERINTENDENT

Gray iron job foundry. Practical and technical knowledge in sand, nodular iron and basic lined cupola. Must have low scrap record and outstanding labor relations. Machine tool castings weighing up to 12 ton. Pouring up to 35 tons per day. Sixty employees. Profit sharing. Address: Box 623, FOUNDRY, Cleveland 13, Ohio.

MALLEABLE FOUNDRY FOREMAN

Must be aggressive, familiar with gating and rigging light to medium castings with ability to get production with minimum scrap loss. Knowledge of air furnace melting preferable but not essential. Location New England. Address: Box 635, FOUNDRY, Cleveland 13, Ohio.

CHEMIST

An old established foundry facing manufacturing company, is in need of a chemist. Location: Middle States.

BOX 536
FOUNDRY **CLEVELAND 13, OHIO**

SALES ENGINEER

Established company in East desires engineer familiar with sand practice to handle sales of furnace and reclaiming equipment to foundries throughout the country.
Please state qualifications and salary expected.

BOX 632
FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRY ENGINEER

As an assistant to plant engineer of a progressive Eastern steel foundry. Must be mechanical graduate and capable of carrying duties in plant engineering, maintenance and construction work. Write giving full details on personal background, experience and salary expected.

BOX 573
FOUNDRY **CLEVELAND 13, OHIO**

OPEN HEARTH MELTER

Experienced in basic steel foundry practice. In replying give complete information which will be held in strict confidence by a single executive. Address: Box 615, FOUNDRY, Cleveland 13, Ohio.

SALES EXECUTIVE

Large jobbing, Semi-steel and Alloy Foundry in Philadelphia territory, has opening for man with sales experience, and a wide variety of sales connections in high grade casting requirements. State age, experience and employment over the past ten years in detail. All replies confidential and will be answered.

BOX 647
FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRY SUPERVISORY PERSONNEL
($6500 plus Bonus)

Large, modern Aluminum-Magnesium foundry needs supervisors thoroughly familiar with all phases of foundry operation and practice. Moving expenses paid. Housing available. Location: Philadelphia area. Send resume with complete personal data and work history.

BOX 657
FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRY ENGINEER

Mechanical engineering graduate with some knowledge of foundry practice and metallurgy. Applicant must be young, intelligent, ambitious and aggressive. We intend to train this man in all phases of foundry work to fit him for a top executive position within next few years. We are a medium sized gray and alloy iron foundry with a strong financial rating and ample opportunity for expansion. Salary and bonus in executive position. Outstanding opportunity for right man. Age: Under 35. Location: Michigan. Address: Box 678, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

For progressive foundry in Indiana. Must be mechanical graduate and capable of carrying duties in construction work, maintenance, and assisting in purchasing. Write giving full details of personal background, experience, and salary expected. Address: Box 631, FOUNDRY, Cleveland 13, Ohio.

SUPERVISOR

Thoroughly experienced in high production mechanized jobbing foundry operation. Must have record of ability to handle men and thorough knowledge of modern equipment and methods. Established Eastern Foundry. State age, experience and salary. Address: Box 655, FOUNDRY, Cleveland 13, Ohio.

SAND TECHNICIAN

Steel foundry in Ohio desires college graduate with experience in sands and sand testing. Give full details and salary expected. Address: Box 656, FOUNDRY, Cleveland 13, Ohio.

Representatives Wanted

SALESMAN

High production nonferrous foundry, division of top rated company desires sales representation in New Jersey and Pennsylvania. Commission Basis. No objection to other lines. Replies held in confidence. Send details, age, experience, other lines handled, etc. Protected Territory. Address: Box 652, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SALESMAN

For bronze, nickel silver and aluminum castings. Wisconsin, Minnesota, Iowa, Illinois and Indiana territory. Proposition offered will depend on experience and ability of the man; either salary or commission basis. Foundry located in Southern Wisconsin. Address: Box 659, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPPLY SALESMAN

Opening for man with experience in both supplies and equipment. Reliable and established firm in Los Angeles and Southern California area. Address: Box 664, FOUNDRY, Cleveland 13, Ohio.

JOBBING CASTING SALESMAN

For gray iron foundry with a long business background located near Chicago. Can give immediate service. Good opportunity as an accessory line.

BOX 641
FOUNDRY **CLEVELAND 13, OHIO**

CLASSIFIED ADVERTISING

Representatives Wanted

CORE OIL SALESMEN

For State of Michigan and also Greater Philadelphia areas.
Excellent sales opportunity for two ambitious and technically qualified core oil sale men with proven records of successful sales, with a nationally known and outstandingly reliable core oil manufacturer, who is expanding direct sales coverage in Michigan and Eastern Pennsylvania areas. Both areas offer exceptional potential volume. Products are well known for uniformity and dependability and are backed up by close personal quality control of a nationally known foundry technician.
Men must be fully qualified in all phases of core room operations and experienced in large volume core oil sales. Salary and commission basis. All replies strictly confidential. State full details, experience and other pertinent data.

BOX 673

FOUNDRY CLEVELAND 13, OHIO

SALES REPRESENTATION

WANTED

Well established foundry engineering works wants thoroughly qualified representative. If possible, foundry expert with established customer relations. Send complete information including experience and references.

BOX 644

FOUNDRY CLEVELAND 13, OHIO

MANUFACTURER'S

REPRESENTATIVE

Experienced and successful agent or organization with engineering background to represent nationally known 56-year old manufacturer of blast cleaning equipment, dust collecting systems, and foundry supplies. Several territories open. Write in confidence giving full details on experience and lines currently represented.

BOX 646

FOUNDRY CLEVELAND 13, OHIO

SAND SALESMAN

Agressive representative wanted for foundry sand sales. Ohio, Indiana, Michigan, Pennsylvania territory. Attractive offer to right man. Address: Box 621, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY SUPERINTENDENT AND METALLURGIST

Desire position in Southern climate because of wife's health. Position now holding considered very good. Foundryman in basic and acid ductile irons, gray iron, semi-steel, also brass, bronze and aluminum, wood and metal patterns, gating, rigging and costs of patterns. Capable of handling light, medium and heavy work, green, dry, and loam sand molding. Well versed in cupola operations and metallurgy. Twenty-eight years experience in executive position. Labor relations very good; neat appearance. Address: Box 679, FOUNDRY, Cleveland 13, Ohio.

FOREMAN—WOOD PATTERNMAKING OR PURCHASING PATTERNS AND CASTINGS

Twenty-two years as foreman and department manager in wood patternmaking in the medium to heavy iron and steel industry (foundry background and foundry connections) including also ten years purchasing patterns and castings, expediting and coordinating. Experience on patterns for the machine tool industry, power presses, rolling mill equipment etc. Best of references from wherever pattern equipment was used. Address: Box 626, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Gray iron, 28 years' experience in production and jobbing, 10 years as a manager of plants with daily tonnages as high as 125 ton, employing up to 300. Man of unquestionable character and excellent ability. Know foundry thoroughly. Address: Box 661, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRYMAN

Thirty years' foundry experience. Capable taking complete charge of production. Practical man. Wide experience in all phases of foundry operation. Gray iron, aluminum and magnesium. Have handled upward of 300 workers. Prefer small shop where production of quality castings is needed. Now employed. Ohio only. Address: Box 625, FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER

Mature, profit-minded, dependable. Has successfully managed four companies—two taken out of the red. Available for service shortly with medium-size company requiring reliable directing ability in management, sales finance and production. Excellent experience, foundry machine and related lines. Address: Box 622, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Practical, technical, age 49, graduate metallurgist with 28 years' broad experience in conventional and highly mechanized foundries. Well versed in molding machines, cupola, cores, sand control. Position with reliable firm wanted. Address: Box 637, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Graduate engineer, 14 years' experience in gray and malleable high production foundries. Well versed in patterns, rigging, scrap problems, molding and inspection. Age 32. Consider employment anywhere, domestic or foreign. Address: Box 643, FOUNDRY, Cleveland 13, Ohio.

CASTINGS SALESMAN

Desire to make connection with progressive foundry. Fifteen years' experience in light and medium gray iron, knowledge of all phases of foundry work. Capable of assisting foundry in pricing, pattern design, production, quality control, etc. Age 35, married, dependable. Present employer 13 years. Available on short notice. Address: Box 665, FOUNDRY, Cleveland 13, Ohio.

EXECUTIVE

Located Philadelphia area, age 47, 20 years management, industrial engineering, personnel, sales, supervision, labor problems. University graduate. Consider factory management or representation. Available short notice. Address: Box 662, FOUNDRY, Cleveland 13, Ohio.

TECHNICAL DIRECTOR OR WORKS MANAGER

Experienced in all phases of foundry operations pertaining to machine, bench, floor and shell molding in gray iron, brass, and aluminum. Also government specifications, heat treating and X-ray inspection. Address: Box 617 FOUNDRY, CLEVELAND 13, OHIO.

FOUNDRYMAN

Available, 25 years' practical and technical experience on ferrous and nonferrous. Capable, qualified of assuming complete charge small to medium foundry. Prefer New England. Age 43, married. Address: Box 624, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER

New established in foundry management consulting field. Experience strong in technical and supervisory functions with reputation for high production and low scrap. Achievements in technical and engineering phases are matter of record. Proven executive ability to develop and manage an organization with effective controls over quality, costs and profits. Under 45. Address: Box 677, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Available. Capable, qualified and experienced to direct all phases of foundry activities. Light to medium heavy work. Green and dry sand. Well versed in cupola operation and metallurgy. Fifteen years in present executive position. Middle aged. Good appearance. Pleasing personality. Address: Box 620, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

MANAGER-SUPERINTENDENT

Top-flight foundryman with 23 years experience in all phases of ferrous operations and sales. Desire position with progressive company. Well versed in producing to specifications and close operational control, on jobbing and production basis. College graduate, 41 years of age. Address: Box 676, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Superintendent or general foreman, practical man, twenty-seven years in gray iron and nonferrous jobbing and production shops. Now employed. Prefer Western or Central New York. Address: Box 668, FOUNDRY, Cleveland 13, Ohio.

MAGNESIUM FOUNDRY MANAGER

Graduate Metallurgical Engineer. Registered professional mechanical engineer. Fifteen years' foundry experience in engineering, plant layout, materials handling, metallurgical quality control, and supervision of both large and small foundries. Address: Box 605, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Available, capable, qualified and experienced to direct all phases of foundry activities, light and medium work, malleable and gray iron. Twenty-two years in the foundry. Age 50. Address: Box 672, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Several years of experience in gray iron, malleable and steel. Will reduce cost and increase production. Very capable of running department efficiently, also assist management in all problems. Address: Box 619, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

College graduate, 20 years' experience in all phases of foundry operation, desire position in gray iron production foundry. Age 42, married. Address: Box 648, FOUNDRY, Cleveland 13, Ohio.

PATERNMAKER AND FOUNDRYMAN

Experienced on medium and very large work, mostly steel. Well versed in pattern construction, heading, gating, chilling, molding. Thirteen years supervisory experienced. Address: Box 612, FOUNDRY, Cleveland 13, Ohio.

WEIGHT ESTIMATING

Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Automatic calculator equipment. Nominal fee. Send blueprints to: CHARLES E. ROLAND, ITASCA, ILLINOIS.

FOUNDRY EXECUTIVE

Well versed in all foundry procedures. Consultant on metallurgy, sand, quality control, melting procedures, production and general foundry problems. Desire position with gray iron foundry. References. Address: Box 636, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Practical experience in laboratory procedures and production supervision for a large gray iron foundry. Degree in metallurgy. Married. Age 25. Prefer Western location. Address: Box 633, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Married, 30, degree in Metallurgy plus a four-year foundry apprenticeship. Broad background dealing with nonferrous casting problems. Desire position as a foundry metallurgist or in foundry supervision. Address: Box 675, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

With 28 years' experience producing quality castings in general jobbing and production, machine tool, cylinders and pressure castings. Well versed in machines, rigging, gating, cupola, green and dry sand molding, working from blueprints. Age 49. Address: Box 638, FOUNDRY, Cleveland 13, Ohio.

FOREMAN

Brass or bronze, experienced in French sand and false core molding, also skin dry molding and tablets. Twenty-eight years' experience in all phases of foundry operations. Address: Box 654, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

For steel cleaning division. Experienced in the most modern methods of cleaning steel castings. Capable of assuming full responsibilities. Best of references. Address: Box 634, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

MANAGER OR SUPERINTENDENT

Malleable or gray iron. Thirty years' experience in all departments. Technical education. Address: Box 640, FOUNDRY, Cleveland 13, Ohio.

EXECUTIVE

Experienced in all phases of foundry operations. Steel, iron nonferrous, plant and industrial engineering, cost control, accounting, industrial relations, machining administration. Address: Box 601, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM FOREMAN

Well versed in all phases of core room operation. Production of jobbing foundry. Production minded. Good labor relations. Free to travel. Address: Box 680, FOUNDRY, Cleveland 13, Ohio.

Accounts Wanted

MANUFACTURER'S AGENT

Production, factory management background. University graduate. Will cover New Jersey, Southeastern Pennsylvania, Maryland, Delaware. Prefer foundry equipment, materials, supplies, or kindred lines. Address: Box 663, FOUNDRY, Cleveland 13, Ohio.

Foundry Work Wanted

WANTED

Heavy Floor Work
Gray Iron Castings
500 to 10,000 Pounds

Controlled metal with specifications to meet your requirements. Phone or wire collect.

THE J. B. EHRSAM & SONS MFG. CO.
ENTERPRISE, KANSAS

Foundry Consultant

FOUNDRY CONSULTANT

Trouble shooting, gating and risering. Improvement of yield. Radiographically-sound, pressure-right castings. Problem castings, centrifugal castings, melting and pouring. Production control, machine scheduling. Address: Box 666, FOUNDRY, Cleveland 13, Ohio.

Opportunity

OPPORTUNITY

British Company with well-established business in foundry supplies will accept American agency for foundry equipment. Manufacture in Britain under license possible. Address: Box 671, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOR SALE
RENT OR PARTNER

Foundry centrally located. Large outside area. Gray iron and brass. Equipped for hand molding. Terms can be arranged. For further information write to:

BARNETT BROTHERS FOUNDRY
118 MAPLE AVENUE PUNXSUTAWNEY, PA.

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

FOUNDRY FOR SALE

Gray iron foundry, small modern well established jobbing shop in Eastern Pennsylvania, fully equipped for small and medium castings. Four to five tons daily pouring capacity. Owner has other interests. Address: Box 651, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Brick and steel foundry, Southern Illinois, 160 x 320 feet, overhead monorail water transportation available. Ideal for mechanized operation, contains equipment. Address: Box 570, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOR SALE

Gray iron foundry in central Michigan specializing in boat anchors, City of Flint manhole castings, all kinds of furnace castings, State Roadside Park Grates, Board of Education boiler grates, and numerous other jobs. Orders guaranteed. Must sell because of ill heath.

BOX 669

FOUNDRY **CLEVELAND 13, OHIO**

Employment Service

EMPLOYMENT COUNSEL, INC.
"All The Name Implies"
JOHN COPE, Manager Foundry Dept.

Recruiting men for employers in the foundry industry throughout the nation. Openings in Steel, Malleable, Gray Iron and Non-Ferrous—Jobbing and Production. Salaries to $20,000.

PLANT MANAGERS	SUPERINTENDENTS
GENERAL FOREMEN	MOLD FOREMEN
CORE FOREMEN	MELTING FOREMEN
CLEANING FOREMEN	MAINTENANCE FOREMEN
PATTERN FOREMEN	METALLURGISTS
INDUSTRIAL ENGRS.	TIME STUDY ENGRS.

And all other Administrative and Sales Positions
WRITE or CALL for registration.
Completely Confidential.

SUITE 500 **7 WEST MADISON ST.,**
CHICAGO 2, ILLINOIS **FINANCIAL 6-2100**

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

Wanted-To-Buy

WANTED

#3 Simpson Muller. Must be in excellent condition.

Hough Payloader. In good condition.

MARCH BROWNBACK, INC.
POTTSTOWN, PA.
TEL: POTTSTOWN 3800

WANTED TO BUY

B. & P. Stationary Sandslinger having two speed 19" Head and approximately 12 foot operating arm length.

STANDARD CASTINGS OF CINCINNATI, INC.
1734 POWERS STREET CINCINNATI 23, OHIO
PHONE: KIrby 6121

WANTED TO BUY

Used Tumbling Mill in Good Condition. Approximate size desired: 42 x 60". Include all information and price in first letter.

BRILLION IRON WORKS, INC.
BRILLION, WISCONSIN

WANTED TO BUY

Stationary Sand-Slinger, 19" Head.

ILLINOIS FOUNDRY COMPANY
SPRINGFIELD, ILLINOIS

WANTED TO BUY

Complete Dietert Sand Testing Equipment. Address: Box 650, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

Furnace Transformers

DELL STEPHENSON & COMPANY
14456 GLASTONBURY
DETROIT 23, MICHIGAN
TEL: VERMONT 5-0697

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

MACHINERY WANTED

Induction Furnaces, Screens, Simpson Mixers, Riehle Compression Testing Machines, Pulverizers, Grinders, Conveyors. Address: **P.O. BOX 1351, CHURCH STREET STATION, NEW YORK 8, NEW YORK.**

WANTED

Modern type Metallograph B. & L. Research, B. & L. model G.B.I.L.S., or equivalent. Also Polishing Equipment.
THE LOCOMOTIVE FINISHED MATERIAL CO.
ATCHISON, KANSAS

WANTED

Automatic Monorail Type Rotoblast Cabinet Machine for use in blast cleaning miscellaneous gray iron castings. Cabinet size approximately 15' 0" long, 10' 0" wide, 9' 3" high. Also a 250# Electric Melting Furnace. Address: **PAUL M. WIENER FOUNDRY CO., MUSKEGON, MICHIGAN.**

For Sale

FOR SALE

Conveyor, in good condition, 50' with 18" rubber belt, lattice frame. Also 3 speed reciprocating feeder, clutch, motor support and gear case, with or without motor. Address: A. H. KOLK, NEWAYGO, MICHIGAN, PHONE 4662.

FOR SALE

One—Clearfield sandmixer, Model #C-610 with #2 bucket loader. 20 H.P. motor, 220 volts, 3 ph., 60 c. Excellent condition.
WELLS MANUFACTURING COMPANY
7800 N. AUSTIN AVE. SKOKIE, ILLINOIS
PHONE: ORCHARD 3-0406

For Sale

FOR SALE

1—20 x 27 American Wheelabrator—Serial Number A-48021 ..... $1750.00
10—Model 2047 Osborn Jolt Rollover Pattern Draw molding machines; new in 1943; replacement cost about $3,500.00; our price ..... 275.00 Each
5—Model 601-13 Osborn Jolt Rollover Pattern Draw molding machines 350.00 Each
1—#405 Osborn Jolt Rollover molding chine—79" table 1000.00
1—#413-3 Osborn Jolt Rollover Pattern Draw molding machine; 130" x 42" 6500.00
1—SPO Model 914 Jolt Rollover Squeezer 250.00
4—International PKL Jolt Squeeze Strip Molding machines; 12" cylinder—like new ..... 375.00 Each
20—#275J Osborn Jolt Squeezers. 125.00 Each
1—Beardsley & Piper Tractor Type Sandslinger with magnetic tower—13' arm 7500.00
1—#SS-30 Stationary Type Beardsley & Piper Speed Slinger with 22" head, 10'6" gib arm, 6' hydraulically controlled ramming unit..... 6500.00
1—Strohman Aluminum Furnace—reverberatory type; 1200 lb. cap.; gas fired; with skip hoist and hydraulic tilting equipment ..... OFFER
1—1500 lb. tilting type Lindberg furnace for aluminum; complete with controls and blower $1500.00
7—Osborn Core Blowers—Model 91, Model 94, and Model 193-4—LIKE NEW ..... ½ New Price
1—#404 Clearfield Mixer $1000.00
1—#30 Speedmuller with loader 1500.00
2—Osborn Core Rollovers—Model 2042; power rollovers, hand-draw.... 250.00 Each
1—Hough Payloader—Model HA; 42" bucket, 6' lift 1000.00
1—Marschke Swing Frame Grinder—10 H.P. 650.00
1—Marschke Double End Grinder—7½ H.P. 275.00
1—Stromberg-Carlson 7-60 Relaydial P.X. Switchboard 1000.00
2—75 HP Ingersoll-Rand Air Compressors ..... OFFER
3—Sly Master Blast Mills; 42" inside dia. x 36" deep ..... 1250.00 Each
Assorted snap flasks and jackets
1—#2 American Wheelabrator Tablast machine; complete with (8) 24' tables and accessories; available with exhauster
1—#1A American Wheelabrator Tablast machine; complete with (6) 26" tables and accessories; available with exhauster

BALCHER MACHINERY COMPANY
1884 S. COMPTON ROAD
CLEVELAND HEIGHTS 18, OHIO
TELEPHONE: FAIRMOUNT 1-1186

FOR SALE

DREVER SALT BATH FURNACE

Bath Size 12' x 4' x 7' depth Radiant Tube Gas Fired Complete with North American Blower and Leeds & Northrup Automatic Recording Temperature Control. Maximum Operating Temperature 1250° F.

Suitable for Salt Desanding or Stainless Cleaning.

CARDINAL STEEL SUPPLY
2695 E. 79TH
CLEVELAND 4, OHIO

FOR SALE

2 International Core Blowing Machines, model SB10, serial 38586 and 39574. 2 Hammond, model WH Heavy Duty High Speed Snagging Grinders, 7½ HP, 220 V., 3 Phase, 60 Cy., Alternating Current Motors, wheel size 20" x 2" x 10", serial 6024 and 6052. 1 model K51T-40 Yale Electric Fork Lift Truck, serial 511202, capacity 4000#, equipped with Edison #30C8 storage battery. Address: **PERU FOUNDRY COMPANY, PERU, INDIANA**

FOR SALE

$550.00 Reda Furnace, Oil Fired, Hydraulic Tilt, New 1951, for 220-3-60 Current.

PYOTT FOUNDRY & MACHINE CO.
328 N. SANGAMON STREET
CHICAGO 7, ILLINOIS

FOR SALE

1952 Model 1000# Reda Furnace. Address: **WM. C. ELLIS & SONS, SO. FRONT, LINDEN AND WAGNER STS., MEMPHIS 3, TENN.**

For Sale

FOR SALE
SHOT BLAST MACHINES

2—14 GK PANGBORN Rotoblast Barrels 1943 & 1947—One with Loader, Without Loader ..... $3750.
With Loader ..... 4500.
1—21 GK PANGBORN Rotoblast Barrel With Loader—Ex. Condition ..... $7750.
1—14'-0" PANGBORN Rotoblast Table 2 Wheels, Dust Collector ..... $7500.
1—AMERICAN WHEELABRATOR Tumblast, 20 x 27 Rubber Belt..... $1850.
1—#1 AMERICAN Tablast, Plain Table. $1750.
1—#1 AMERICAN Tablast, 18" Auxiliary Tables ..... $2000.
1—#1 AMERICAN Tablast, 12" Auxiliary Tables ..... $2500.

JOLT ROLLOVER MACHINES

1—3000# HERMAN ..... $3750.
1—607-E2 OSBORN, Real Bargain.
4—INTERNATIONAL TYPE G 20"....$450. ea.
3—14" x 8" INTERNATIONAL Type RJ ..... $275. ea.
1—401-1 OSBORN ..... $375.

JOLT STRIPPING MACHINES

1—1750# HERMAN ..... $975.
2—559 OSBORNS .....$1075. ea.

JOLT SQUEEZE MACHINES

11—275J OSBORNS.....$290. ea.
6—INTERNATIONAL Type LJS.....$240. ea.

JOLT SQUEEZE STRIP MACHINES

2—MILWAUKEE #193-4 .....$1550. ea.
3—INTERNATIONAL Type PKL .... 350. ea.

CORE BLOWERS

1—OSBORN #192 ..... $ 675.
1—CHAMPION #400 ..... $2750.

GRINDERS

1—10HP Double End HAMMOND ..... $650.
1—7½ HP U. S. Electric (new guarantee) $575.

AIR COMPRESSORS

1—40 HP GARDNER DENVER 1949.... $1975. Rebuilt—New guarantee
2—20 HP CURTIS ..... $775.

THIS IS PARTIAL LISTING
IF YOU DON'T SEE WHAT YOU WANT,
CALL US COLLECT
LAND-WHITEHEAD EQUIPMENT CORP.
P.O. BOX 939 (PHONE 54379) READING, PA.

FOR SALE
SAND BLAST EQUIPMENT

Wheelabrators-Tumblast size 48 x 42. $3000.00 to $1000.00.
Wheelabrator size 48 x 48. Like new. $5250.00.
Wheelabrator Tumblast 36 x 42. $4500.00.
Wheelabrator Table Blast 8'. $3000.00.
Pangborn Table Blast 10'. $3000.00
Sly-master Blast size 56 x 42. Good condition.
Pangborn ES-207 Blast Cleaning Cabinet used for Strip steel or bar stock. $1750.00.
Sand Blast Cabinets, pressure tanks, dust collectors and blowers. All sizes.
Contact us for your sandblasting needs or any surplus sandblasting parts and equipment you have for sale.
Will accept your small machines as trade in on any of the above equipment.

DIAMOND SAND BLAST, INC.
5654 WEST JEFFERSON
DETROIT 9, MICHIGAN

FOR SALE

30—Tabor Pneumatic Molding Machines, column type, 10" squeeze..... $110.00
Osborn Portable Molding Machine #74 ..... $100.00
5—Adams Portable Hand Squeeze Molding Machines ..... $ 50.00
40—Osborn 2047-4 Jolt Rollover, Table 18 x 24, 8½" draw, excellent core rollover $290.00
6—#30 Tabor Hydraulic Jolt Rollovers, Table 30 x 41, 12" Draw, Portable. $1200.00
Wheelabrator Table #2, with 8-24" Multi-Tables $2750.00
Jeffrey, #2 Sanditioner, Capacity 15-20 tons $400.00

M. ELSTEIN
141 MANGIN STREET
NEW YORK 2, NEW YORK

PRICED RIGHT FOR QUICK SALE

BUSCH SPRUE CUTTER, heavy duty for steel, 8" throat, capacity 1¾" square, 2½" round, equipped with 7½ HP, AC motor.
INTERNATIONAL CORE BLOWER #SB11, 15" x 24" Table.
MILWAUKEE ELECTRIC HOIST 1 ton capacity, 2 motors, motorized trolley, 10' lift.

GLOBE MACHINERY CO.
602 W. LAKE STREET, CHICAGO 6, ILLINOIS
ANDOVER 3-4185

FOR SALE

One lot coal cooking and heating stove; iron and aluminum patterns. Lump sum price for lot. Address: Box 642, FOUNDRY, Cleveland 13, Ohio.

For Sale

FOUNDRY EQUIPMENT
MOLDING EQUIPMENT

Herman Jolt Rollover #6000, 40" x 60", 194?
2—Herman Jolt Stripper, 48" x 54", 1947
Osborn Jolt Roll Over, model 405S, with Roll out Car 44" x 48"
5—275 PJ Osborns—late type
6—SPO Squeezers 110J
29—2047-4 Osborns Jolt & Draw
1—558 Osborn Pin Lift.
3—Haynes Squeezers
5—Milwaukee Squeezers

MOLD HANDLING
& SHAKEOUT EQUIPMENT

Productive Shakeout 6 x 8
900 ft. 10" Logan Roller Conveyor 3½" dia
Jeffrey Powered Wood Slat Conveyor

SAND HANDLING EQUIPMENT

Unit A Syntron Feeder Hopper, 6' x 6'
2—Aerator, Overshot type, 9' x 2' & 4' x 3'
Aetna Sperser System
Simplicity Shaker, model C
Steel Hopper System
1—6' x 7' x 3'6"
1—12' x 7' x 3'6"
5—4'6" x 4'6" x 1'

CRANES & HOISTS

15—Curtis Traveling Bridges, 15' span
16—Curtis Air Hoist, 5 & 6" Cylinders, 3½' x 4' Lifts

CUPOLA & LADLE EQUIPMENT

Roots-Connersville Blower, 14 x 36, 30 hp., late
Roots Connersville Blower, 22 x 66, 75 hp
Geared Ladles
Spencer Turbo Blowers, 2250 cfm @ 16 oz.
2850 @ 16 oz.

MISC. FOUNDRY EQUPT.

15,000 ft. #458 Chain Conveyor
Brinnel-Rockwell-Richie Testers
2—Int'l SB11 Core Blowers
Demmler #1 Core Blower
Baker Lift Truck, 6000# cap., 1948
Logan Wood Slat Conveyor, motorized, 36" x 35' Roller Conveyor
7—18" Pedestal Grinders
Tons of Flasks 12 x 18 to 48 x 120
Core Blower, Champion, model CB400, 300 lb.
Roto-Clone units, 24W & 36W, with sludge ejectors
Vibrators, Osborn, 1⅝" x 2"
Welded Steel Pouring Crucibles, new, 1700#
Bottom Dump, Sand Buggies
Exhaust Fans—to 60"
Fire Extinguishers—CO2
Exhaust Blowers—all sizes

WE WILL BUY—FROM 1 PIECE UP TO ENTIRE FOUNDRY

ALLIED MATERIALS HANDLING CO.
4657 SPRING GROVE AVE.
CINCINNATI 32, O.
PHONE: MU 5465

FOR SALE

Osborn #413-9 Molding Machine Serial 11947 Built in 1949.
Excellent Working Condition.

BALDWIN-LIMA-HAMILTON CORPORATION
HAMILTON, OHIO

FOR SALE

One 100 KW Westinghouse transformer, 22000 volt primary 115-230 volt, three wire secondary. Address: **FORT PITT STEEL CASTING DIVISION, MC KEESPORT, PA.**

For Sale

FOR SALE

2—Mechanized Sand Systems

MELTING EQUIPMENT

1—3½ Whiting Cupola charger, blower, mixing ladle, Foxboro control.
1—Newton #48 and 1 Whiting #4 Cupola

LADLES

2—"U" type Modern Reservoir 3000# Ladles
1000# Cylindrical Ladles, 500# covered ladles

BLOWERS

4—Spencer Turbo Blowers, 40 HP 3600 CFM @ 24 oz.

MOLDING MACHINES

Johnston & Jennings #918 Rollover
Davenport 28A Rollover
Osborn 275J Portable Jolt Squeezers
Herman Rollovers 40 x 60" table
Osborn 276J Portable
Adams Portable Jolt Squeezers
Demmler Core Blowers #1, #3
Champion CB400 Core Blower
Osborn 601 Rollovers

MISCELLANEOUS

Farquhar Portable Loader
Lewis Shephard Stacker
Large Dravo Heating Units
Electric Lift Trucks
Simplicity Sand Blender, Model C, 24 x 31"
3—American Sand Cutters, excellent Conveyors
Steel and Aluminum flasks, core plates.
Largest Stocks of USED FOUNDRY EQUIPMENT in the U. S. sold on money back guarantee.

UNIVERSAL MACH. & EQUIP. CO.
320 E. BROAD ST.
SHILLINGTON, PA.
PHONE READING 30311 OR 40146
R. B. HARRISON, MGR., FDRY. DIV.

FOR SALE
TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
6750	24 oz.	Spencer	800	8 oz.	No.Am.
4500	16 oz.	G.E.	660	20 oz	A-B
4000	42 oz.	Spencer	500	10 oz.	No.Am.
3500	40 oz.	Spencer	400	4.3 oz.	Spencer
2800	1 oz.	Spencer	340	20 oz.	A-B
2700	16 oz.	No.Am.	320	12 oz.	Spencer
2700	16 oz.	Spencer	225	16 oz.	Spencer
2500	7 oz.	Sturt.	180	15 oz.	Spencer
2200	16 oz.	No.Am.	9100	7" SP	Sturt.
2000	2½ oz.	Spencer	1100	4½" SP	Bayley
2000	1 oz.	Spencer	100	7" SP	Spencer
1150	20 oz.	No.Am.			

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

1—6 ton Modern Geared Ladle w/square bail
1—20 x 3 x 8 Fox Swing Grinder, 15 H.P., w/rail and booth
7—International Type G Air-operated Jolt Rollover Machines—sizes: 20 x 6, 24 x 8, 24 x 10, 30 x 12.

ZENITH FOUNDRY COMPANY
1501 SOUTH 83RD STREET
WEST ALLIS, WISCONSIN

FOR SALE

Magnaflux Inspection Unit; Degreaser, 2-slot; Metal polishers, barrel type; 10 ton, 6' x 8' Platform Scale; Warehouse Lifts; Clay Crusher; Water Pumps; Bolt and Sheet Coolers; Speed Reducers; Sand Hopper; Blowers; Motors. Partial list. Address: GENERAL MACHINERY, 3544 LA SALLE, ST. LOUIS 4, MO.

FOR SALE

1—International 14" type JSK-7 Jolt, squeeze, pin strip, multiple molding machine. Like new, used two months.

THE MAJESTIC COMPANY, INC.
HUNTINGTON, INDIANA

For Sale

FOR SALE

MOLDING MACHINES
2—No. 275 Osborn jolt squeezers.
2—Deuscher Stationary jolt squeeze.
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers.
4—#610 Johnston & Jennings Air Jolt Rollover Draw Portable 24 x 30 table.
1—Tabor 36 x 50 table Air Jolt Rollover Draw, 3000# capacity.
2—International PKL 14"-5½" Jolt Squeeze Pin Lift.
1—Tabor Pedestal Core Rollover Hand Ram Rollover Draw 14 x 20 table 8" draw.
BLOWERS FOR CUPOLAS AND FURNACES
1—15 HP North American 2100 CFM at 16 ozs.
2—15 HP Spencer-Turbine 2250 CFM at 16 oz.
10—High temperature blowers 1400° F. 9000 to 15000 C.F.M.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
1—Connersville rotary blower 22 x 66 45 cu. ft. per revolution 9000 CFM.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—5 HP 20-oz. Spencer Turbine Blowers.
2—2 HP 20-oz. Spencer Turbine Blowers.
METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnaces, gas fired.
1—Hausfeld Stationary Brass, Multiple gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.
New 32" to 41" dia. shell cupolas made to order.
New 1000 lb. aluminum cap. tilting crucible furnaces to specifications.
MISCELLANEOUS
1—Stoney crane type shakeout.
1—Dings type M magnetic separator.
1—NC-4 sand separator.
1—#1 Demmler core blower.
2—#16 Roto-clone units complete.
1—McLeod Blast Tumbling Barrel, Size 36 x 36, Type S.
1—McLeod Small Sand Blast Barrel 24 x 24.
1—36W Wet Type Roto-Clone 34000 CFM.
1—24W Wet Type Roto-Clone 13000 CFM.
Complete stock of rebuilt mill and dust exhaust blowers.
1—27 x 36 American wheelabrator, tumblast with rubber belt.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

ALL EQUIPMENT OF GRAY IRON FOUNDRY INCLUDES

No. 3 Cupola
Adams Molding Machines
Adams & Hines Flasks
Demmler No. 55 Core Blower
Tumbling Mill
Outdoor Truck Scales
Air Compressor
Sand Testing Equipment
Other Miscellaneous Items

DES MOINES FURNACE & STOVE REPAIR CO.
DES MOINES IOWA

FOR SALE

1—Sandslinger
2—1000 lb. Stroman Aluminum Furnaces
2—Tabor Rollover Machines
5—Large Demmler Core Blowers
2—Osborn #92 Core Blowers
2—Robbins 3 x 4 shakeouts
1—Simplicity 4 x 10 Shakeout
1—#30 Muller, Beardsley & Piper
2—Osborn #701 Rollovers
2—Tabor Squeeze Strip Machines
6 Sets aluminum Flasks, 49 x 37, 6 cope, 12 drag
12—2" 3 way Tapping Machines for Fittings

NATIONAL FOUNDRY COMPANY
OF NEW YORK, INC.
2-40 SANDFORD STREET, BROOKLYN 5, N. Y.

TESTING MACHINES

1—Riehle 400,000# hydraulic and beam type Compression Testing Machine
1—Riehle 200,000# Universal
2—Riehle 100,000# Universal
1—T. Olson 100,000#
Also Simpson Sand Mixers 18" dia. Laboratory, #0, #1, #1½, #2, #3
Miscellaneous: Screens, Pulverizers, Grinders, Conveyors—all types, Tyler Rotap Screens, etc.

OUR 36th YEAR

CONSOLIDATED PRODUCTS CO., INC.
13-20 PARK ROW NEW YORK 38, N. Y.
TELEPHONE: BARCLAY 7-0600

FOUNDRY EQUIPMENT

PRICES REDUCED

BLOWERS
Spencer Turbo Blower, 2250 CFM @ 16 oz., 15 HP, 220/440 V motor. New 1946. $900.00.

CORE BLOWERS
Demmler 3 E Drop Away Draw. New 1946. $950.00.

CRANES
5 Ton P & H Overhead Elec. Traveling Crane, 30' 6" span, 15' lift, 3 motors, 220 V A.C. New 1946.
10 Ton Northern Bridge Crane, box frame, double girder fish belly, 3 motors, 230 V D.C., 54' 7½" wide c to c of wheels. Can be cut down to fit narrower span. $6500.00.

ELECTRIC FURNACE
Pittsburgh Moore Rapid Lectromelt, Size V. 200#-300#. Heats 100 KVA. $3000.00.

GRINDERS
Fox Swing Frame 10 HP 3/60/220 $550.00.
U. S. Swing Frame 15 HP $750.00.
McCabe High Speed Double End 2" x 24". $800.00.
Ransom 8B Double End 2" x 20". $300.00.

HOISTS
Ingersoll Rand 4000# Type D, pneumatic. Late serial number. $500.00
500# American Lo Hed, 220 V. $150.00
2000# American Lo Hed, 220 V, $350.00
2000# Detroit Electric $300.00
1000# Cleveland 220-440 V.
1000# Detroit 220-440 V.

LADLE
3 Ton Whiting Geared Ladle. Like New. $450.00

MOLDING MACHINES
2 Champion Pin Pushoffs, 44" x 44" x 12" draw. New 1948. Excellent condition. $450.00 each.
2 Champion Pin Pushoffs, 46" x 46" x 12" draw. New 1946. Excellent condition. $850.00 each.
2 Champion Jolt Squeeze Strip Molding Machines, stationary 12" jolt cylinder, 8" lift, 18" x 21" table. $175.00 each.
1 Champion Hand Rollover, 24 hand clamp, 26" x 16" table. $250.00
1 Johnston & Jennings 218 Rollover Pattern draw table, 30" x 24". $600.00
1 International 13 PJS Staty. Jolt Squeeze Molding Machine, 13" jolt cylinder, table 26" x 18". $250.00
1 Herman Rollover Pattern Draw, 20" x 30" with 6" bumper. $2000.00
1 Herman High Speed Jolt Rollover, 4000# capacity, 30" x 60" with 32" x 48" bumper, 13" cyclinder. Pattern device. $3000.00.
1 Osborn Portable Jolt Rollover Pattern Draw. Model 601-13, 30" x 24" flask size, 10" draw, 900# capacity. $500.00
1 Osborne 23" x 24" table jolt squeeze molding machine.
1 Osborne 17" x 24" S14P Rollover. The above two machines comprise a unit with overhead sand hoppers, belt feed and dump type. $3500.00 for unit.

MULLERS
Simpson #1
Simpson 3H
Clearfield 404, 5 HP motor, 440 V.
Clearfield 610, 20 HP motor.

ROD STRAIGHTENER
Pneumatic Wire Straightening Machine, guillotine type. Excellent condition. $300.00

ROTOBLAST
Pangborn Rotoblast Table. This unit was made for handling aircraft cylinders. It has been used very little. Complete with dust collector and shot elevator. Excellent condition.

SHAKEOUT
4 x 6 Simplicity.

SLINGER MOTORS
2—15 HP B & P Slinger motors and shafts.

WHEELABRATOR
36" x 42" American 370 Cabinet Type Tumblast, 15 HP main drive. Excellent condition. $4250.00

WE BUY FOUNDRIES OR INDIVIDUAL MACHINES.

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PHONE: ANDOVER 3-3430

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Attractively Priced—Immediate Delivery

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7—Drag Plates (round), size range 3' x 1" to 5' x 1½"

46—Core Plates, size range 1'6" x 5'6" x ⅝" to 9'5" x 10' x 1⅛"

13—Binders, Ribbed, size range 8" x 12'10" x 1' to 8½" x 19'4" x 1'6"

7—Binders, Solid, size range 11" x 10' x 1'1" to 1' x 23'11" x 1'6"

26—Runner Boxes, size range 1'2" x 3'6" x 8" to 4'6" x 17'9" x 2'2"

7—Cheeks, Round, size range 10'3" x 2'6" to 10'6" x 2'4"

4—Pit Extensions, all 1'2" x 18'3" x 8½" high

12—Weights, 8,340# to 89,200#

Ladles (lip pouring), one 20-ton two 30-ton

Also miscellaneous Flask Sides, Ends, and Lewis Flasks

BLAW-KNOX COMPANY

BUFLOVAK EQUIPMENT DIVISION

1543 Fillmore Ave., Buffalo 11, N. Y.

***Attn:* E. B. Seligmann—Phone FILLMORE 2100**

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FOUNDRY SUPPLIES

150—#12 Crucibles
565—#30 Crucibles—Clay-graphite-bottom pour, Blueprint Available.
800—lbs. Sheet Mica, 1/32" x 36" x 36", Molding Grade
450—Carburizing Pots—10" ID x 6½" deep, High Nickel Alloy, Blueprint Available.
220—Covers for above pots—Blueprint Available.

ALLISON DIVISION
GENERAL MOTORS CORPORATION
INDIANAPOLIS, INDIANA
BELMONT 1541, EXT. 2343

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Motors, Generators, Transformers from 1 HP to 2500 HP
World headquarters for T.E.F.C. and explosion proof motors.
World's largest inventory.

ELECTRIC EQUIPMENT CO.
ROCHESTER, N. Y.

FOR SALE

American Sandcutter, Model AM, Size 69/45, Serial #205; 220/440 Volt; in excellent working condition. Machine available immediately, complete with 70 ft. of cable and two outlet receptacles. Address all inquiries to: **KEUTHAN FOUNDRY DIVISION, THE BLACK-CLAWSON COMPANY, MIDDLETOWN, OHIO. PHONE: 2-8861.**

FOR SALE

SAND DRYER AND COOLER, Bartlett & Snow rotary, 54" cylinder, 12' length, complete.
2 APRON CONVEYORS, under storage hopper type, 36" wide, 13' centers. Complete with 7½ H.P. motors, Link Belt reducer.

Equipment practically new
Engineering change eliminates use.

ILLINOIS FOUNDRY COMPANY
SPRINGFIELD, ILLINOIS

FOR SALE

1—International Type PK Jolt Squeeze Pin Lift—18" Cylinder, 8" Lift.

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO.
2052 LINCOLN PARK WEST
CHICAGO 14, ILLINOIS
LINCOLN 9-6121

FURNACE FOR SALE

1947 Model Oil Fired Stroman Sklenar Furnace, 400 pound capacity, for nonferrous melting. Oil type with air powered tilt. Address: Box 577, FOUNDRY, Cleveland 13, Ohio.

FURNACES FOR SALE

Ten used heat treating furnaces and two seven ton gantry cranes. Good condition and available for immediate delivery. Address: **BAER STEEL PRODUCTS, INC., BOX 1423, BOISE, IDAHO.**

FOR SALE

MOLDING MACHINES

3—Milwaukee Jolt Squeeze Machines, Model #123-13.
2—Johnson & Jennings Jolt Rollover and Pattern Draw, with Automatic adjustable roll-out conveyor, Model #918-B, 20" draw, table size 44" x 54", air operated, serial numbers; 2518 and 2519. 1943 Machines. Used one year. LIKE NEW.
1—#332 Osborn Jolt, Squeeze, Rollover, Pattern Draw; Draw 9", Flask Size, 25" x 36".
6—Osborn #2047 Jolt Rollovers; 600 lbs. capacity, 8½" draw, Flask Size, 22" x 16" x 10⅛" deep, 1943 Machines.
1—Johnson & Jennings Jolt Squeeze Molding Machine, Serial Number 20873194.
5—Osborn #275-J Jolt Squeeze Molding Machines.
4—Champion Jolt Pin Lifts, Size 42-6.
1—International Jolt Pin Lift, Size 42-6.
1—#405 Osborn Rollover and Pattern Draw Molding Machine.
3—#2155 Spo Jolt Squeeze Pin Lift, 1948, LIKE NEW.
1—#814-P Osborn Jolt Squeeze Pin Lift.

GRINDING EQUIPMENT

1—Besley Dry Grinder, Model #372, Circular Shape, size 53" Morton 20MT4 abrasive disc, serial #283442, Motorized, 20 H.P. Howell, 1943 Machine, used 1 year, LIKE NEW.
2—Fox Swing Grinders, Model #6, Wheel Size 20" x 2". 15 H.P. Motor, LIKE NEW.
1—3 H.P. double stand grinder, flat belt drive 220/440/3/60.
1—10 H.P. double stand Grinder—direct connected 220/440/3/60.
3—7½ H.P. double stand Grinders—direct connected 220/440/3/60.

SAND HANDLING EQUIPMENT

1—American Sand Cutter, size 69 x 45, Model AM, 1945 Machine.
1—#2 Royer Sand Conditioner, Portable.

CORE ROOM EQUIPMENT

1—Lanley Core Oven, 6' high, 3' deep, 7' wide, 4 door, 1950 Machine, LIKE NEW.
1—#91 Osborn Core Blower, Serial #10050-F.
2—Redford Bench Type Core Blowers.
1—#3 Demler Core Blower.
6—#92 Osborn Core Blowers.

BLOWERS

2—Spencer 5400 CFM, 16 Oz., 40 H.P. Motor 220/440, Serial #7178.
1—Universal Blower, Size B-40.
1—50 H.P. Spencer Turbine Cupola Blower 16 oz. 220/440/3/60.
1—20 H.P. North American Turbine Blower 24 oz. 220/440/3/60.
2—3 H.P. Blowers for furnaces 16 oz. 220/440/3/60.

SAND BLASTING EQUIPMENT

1—American Wheelabrator 15" x 21" 1 cubic ft. capacity, 1946.
1—Baird #10 Tumbling Machine, 100 lbs. capacity.
1—Tumbling Barrel, 28" diameter, 40" long, equipped with 7 H.P. Motor. Speed Reducer.

SHAKEOUTS

1—Simplicity Shakeout 3' x 5', new in 1948.
2—Simplicity Shakeouts, 3' x 3', new in 1948.
1—4' x 10' Robbins Shakeout, 7½ H.P. Motor.
1—4' x 6' Simplicity Shakeout, Model D, 1600 lbs. capacity, 10 H.P. Motor.

MISCELLANEOUS FOUNDRY EQUIPMENT

1—Casting Straightening Press, Mfg. by French Oil Co. 250 ton cap. 36' x 144' bed.
1—Gogan Brinell Testing Machine, 1945, 3000 KG, 4 Poster, 12" Stroke, Bed 35" x 25". Never Used.
1—12' Powerized Belt Conveyor, 24" belt.
1—80', 24" Above Rail Roller Conveyor, 1½" Rollers, 8" Centers, 10' Sections.
1—Climax Wire Straightener, 1/16" to ¾" Capacity with 3 H.P. Lima Drive.
1—Riehle Tester, 100,000 lbs. Screw Type.
1—Riehle Tester, 150,000 lbs. Screw Type.
2—Vaporfiers #5, Serial # 320 and 321.
1—Bradley Hammer, 75#, 10 H.P. motor, 1945.
1—G.E. Battery Charger, M.G. Set, Like New.
1—6 x 12 Volt Battery Charger.
1—Milwaukee Sprue Cutting Machine 2" Round, 1⅝" Sq. Cap. 1000 ft. of #458 Conveyor chain with trolleys.

VARIOUS SIZES STEEL FLASKS, HINES POP-OFF FLASKS, AND FREMONT FLASKS AND JACKETS.

A.A.A. MACHINERY & EQUIPMENT CO.
856 EDDY ROAD CLEVELAND 8, OHIO
PHONE: LIBERTY 1-6545

AUCTION SALE

Complete sale of all equipment, machinery buildings and land.

DATE: JUNE 11, 1953

Partial Listing of Equipment

1—1 Ton Electric Furnace complete with 1000KVA Transformer—22000 Volt Primary

1—2 Ton Electric Melting Furnace complete with 2500 KVA Transformer—22000 Volts Primary.

1—#2 SIMPSON Sand Muller complete with Skip Hoist & Aerator

1—INGERSOLL RAND 1350 Cu Ft. Air Compressor, complete with 200 HP synchronous motor, direct Drive.

1—INGERSOLL RAND 50 HP Air Compressor—Unit Type

1—PANGBORN Sand Blast Room, complete with Dust Collector.

3—FOX Grinders 24″ with totally enclosed motors #5

4—276 P. J. OSBORN Jolt Squeeze

1—1000# HERMAN Jolt Machine

1—4000# HERMAN Jolt Machine

1—#918 JOHNSON & JENNINGS Jolt Rollover

1—#243 OSBORN Jolt Rollover

2—#559 OSBORN Jolt Strippers

5—DAVENPORT 24 x 30 Jolt Strippers

2—MILWAUKEE 32 x 38

4—Core Ovens

1—10 Ton Overhead Traveling Crane 30′ Span

1—5 Ton Overhead Traveling Crane 30′ Span

20—1 & 2 Ton Air Electric Hoists

Approx. 300′ of 27″ H.D. Foundry Roller Conveyor

Complete Sand Testing Equipment.

Numerous Other Items

For Further Information Contact:

BISON CASTING, INC.
575 Howard St., Buffalo, N. Y.
Phone: Wash. 2800

or

RALPH ROSEN
Auctioneer
Buffalo, N. Y.

FOR SALE

Molding Machines

1—Mold Conveyor complete with 35 cars 38″ x 72″
3—#2166 Spo Jolt Squeeze Pin Lift
4—#814-P Osborn Jolt Squeeze Pin Lift
1—6000# Herman Rollover, Jolt and Pattern Draw 42″ x 90″
5—#601-13 Osborn Jolt Rollover and Pattern Draw
4—#2047-4 Osborn Jolt Rollover and Pattern Draw for cylinder head core production
2—22″ x 42″ Tabor Jolt Rollover and Pattern Draw, 600# 10″ draw
2—SA-34 Davenport Jolt Rollover and Pattern Draw, 2500# jolt cap., 15″ draw, 34″ x 48″ table, flask 36″ x 64″
1—SA-28 Davenport Jolt Rollover and Pattern Draw, 1500# jolt cap., 12″ draw, table 30″ x 40″
5—Champion Draw Power Pushoff Machines 10″ draw, 38″ x 40″ table
3—International Type JFL Jolt Ram, Foot-lever Pin Lift.
3—International Type R Hand Rollover
2—#405 Osborn Jolt Rollovers & Pattern Draw.

Core Room Equipment

1—#1 Demmler Core Blower
6—#92 Osborn Core Blower
1—20″ Paddle type sand mixer
2—#3 Simpson Mullers
2—#2 Simpson Mullers
2—#70 Beardsley-Piper Mullers
1—Revolving Core Conveyor Table
1—Link-Belt Core Breaker Drum approx. 6′ x 10′
Various sizes transite core plates

Cleaning and Grinding

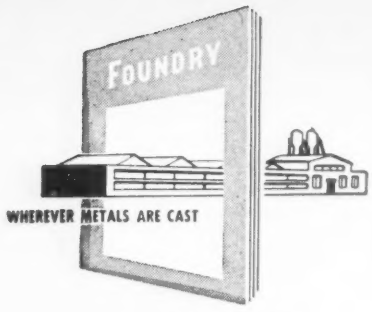
2—Fin Cleaning Machines for cleaning cylinder heads
1—3 H.P. double stand grinder—flat belt drive 220/440/3/60
1—10 H.P. double stand grinder — direct connected 220/440/3/60
3—7½ H.P. double stand grinders—direct connected 220/440/3/60

Misc. Foundry Equipment

1—Pug Mill—Link Belt 42″ x 96″
1—Atlas Car & Mfg. Co. Car Scale
2—Charging Cranes for cupolas, Shepard 3 ton cap. D.C. Cab operated. Complete with monorail.
1—30 ton Bridge Morgan overhead crane DC. 15 ton main hoist, 5 ton aux. hoist, 54′ 6″ span
1—5 ton Overhead crane Cab operated DC. 57′ span
Pouring ladles Whiting and Modern 900 lbs. capacity.
1—4′ x 10′ Robbins Shake-out with 7½ H.P. motor 220/440/3/60.
1—4′ x 6′ Simplicity Shake-out, Model D, 1600# cap. 10 H.P. 220/3/60.
1—500# Hausfeld hand tilt furnace
3—Stationary Sand Slingers—Beardsley-Piper 16″ head
2—#3 Jeffrey Vibrators
4—#4 Jeffrey Vibrators
1—50 H.P. Spencer Turbine Cupola Blower 16 oz. 220/440/3/60.
1—20 H.P. North American Turbine Blower 24 oz. 220/440/3/60.
2—3 H.P. Blowers for furnaces 16 oz. 220/440/3/60.
1—Pig Mold Conveyor (Link-Belt) 74′ lg. complete with drive for aluminum and magnesium.
2—1000 Gals. p. min. Centrifugal Pumps, Ingersoll-Rand, 52 ft. head, 5″ suction, 4″ discharge, dir. connected to 20 H.P. 220/440/3/60, Rebuilt.
Various sizes steel flasks, Hines Popoff flasks and jackets.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

15019 Saranac Rd., Cleveland 10, Ohio — Telephone—GLenville 1-1538



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Dear Reader:

We enjoyed the opportunity to see so many of you at the Foundry Convention in Chicago. Alas, there were only the usual hours in a day. Most of us ran out of time (as well as steam) to see everyone, do everything!

The Editors were major midnight-oil consumers. Their many reports of the meetings appear elsewhere in this issue. If you attended this year's convention, this Post-Convention issue of FOUNDRY will give you the perspective which comes from good reporting. If you weren't there, you should find much interesting reading in this special issue.

—o—

Doc Lee was there: One of the many high-spots of the week in Chicago was the presence of columnist Ralph L. Lee "on reportorial assignment for FOUNDRY". Several of the members of the business staff have been and are regular readers of Doc's "Man-to-Man" feature which appears in FOUNDRY. We enjoyed several good sessions with the genial philosopher from Birmingham and invite you to enjoy him through his regular feature which appears in each issue.

—o—

Gold Medal Awards: From time to time, we have made reference to the growth of the dynamic foundry industry. It always has been easier for us to comprehend progress in terms of noting "how far we have traveled". We are sure that each of these distinguished contributors to foundry progress (and recipients of A.F.S. Gold Medal Awards) would be among the first to pay tribute to the hundreds and thousands of un-heralded foundrymen who have made this great industry what it is today—an industry on the threshold of expanded production far beyond anything we have known before.

1924	**John Howe Hall**
1924	**Enrique Touceda**
1925	**Dr. Richard Moldenke**
1925	**Dr. Robert J. Anderson**
1925	**Dr. E. V. Ronceray**
1926	**John Shaw**
1926	**Thomas Turner**
1927	**Robert Alexander Bull**
1928	**A. E. Outerbridge Jr.**
1929	**Jesse Lee Jones**
1930	**Dr. Harry A. Schwartz**
1931	**Ralph S. MacPherran**
1932	**Dr. H. W. Gillett**
1932	**LaVerne W. Spring**
1933	**Dr. Guilliam H. Clamer**
1934	**Dr. Arnold Lenz**
1935	**L. L. Anthes**
1936	**Dr. Heinrich Ries**
1936	**David McLain**
1937	**John Ward Bolton**
1937	**Charles Willer Briggs**
1937	**Dr. James T. MacKenzie**

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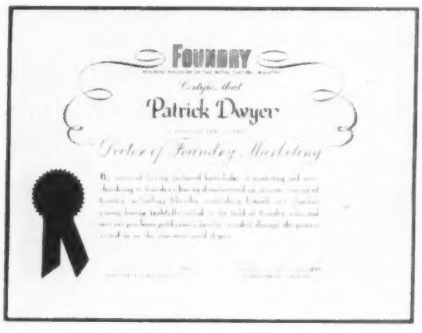
1938	Frederick Ayres Lorenz
1939	Donald James Campbell
1939	Harold Sands Falk
1939	James Ramsay Allan
1940	Nathaniel K. B. Patch
1940	Frederick A. Melmoth
1940	Frederick Ketchum Vial
1940	Harry Walter Dietert
1941	Charles Edgar Hoyt
1941	Donald J. Reese
1941	Max Kuniansky
1941	Fred L. Wolf
1942	Alfred L. Boegehold
1942	John E. Galvin
1943	Carl F. Joseph
1943	Rufus F. Harrington
1944	Alfred W. Gregg
1944	William G. Reichert
1945	Robert Edwin Kennedy
1945	Clarence Edgar Sims
1946	Peter Blackwood
1946	Hyman Bornstein
1946	Howard F. Taylor
1947	Russell J. Allen
1947	R. A. Flinn Jr.
1947	Harry Mark St. John
1947	Henry S. Washburn
1948	Egbert H. Ballard
1948	R. G. McElwee
1948	Peter E. Rentschler
1949	Russell J. Anderson
1949	Silvio C. Massari
1949	G. Vennerholm
1950	Clarence H. Lorig
1950	Richard Schneidewind
1951	Alfred A. Boyles
1951	Victor A. Crosby
1951	Thomas W. Curry
1952	Albert P. Gagnebin
1952	Keith D. Millis
1952	Henton Morrogh
1952	Albert Portevin
1952	Frank G. Steinebach
1953	George John Barker
1953	I. Richard Wagner
1953	William John Grede
1953	Daniel E. Krause
1953	William Romanoff
1953	James H. Smith

It is gratifying to observe the number of Gold Medalists still active in the foundry industry today.

—o—



Doctor Dwyer: We have had the pleasure of awarding a few diplomas ourselves—in (we hasten to admit) a purely whimsical mood. Typical of the "Doctor of Foundry Marketing Awards" given to our friends who have returned our special examination form is this diploma recently given to Engineering Editor Pat Dwyer. At the Convention several recipients reported that their diplomas are an appreciated and attractive addition to their office decor. Wouldn't you, dear reader, like to take our exam and qualify for a diploma suitable for framing?

F. A. Rosefeld

Business Manager

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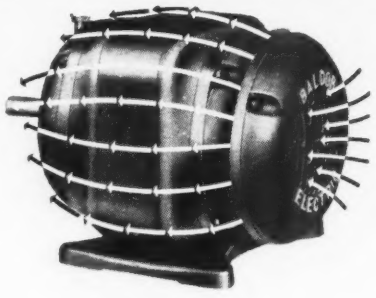

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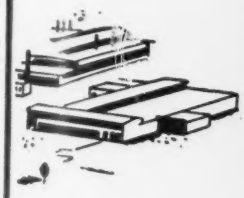

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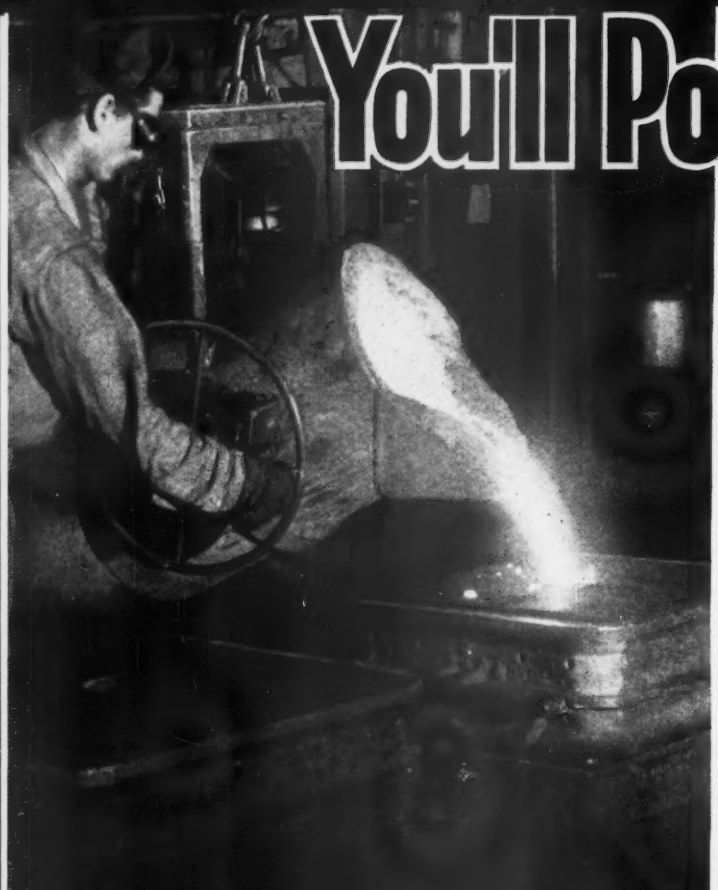

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WORKING TOGETHER with practical foundrymen for more than thirty years MODERN engineers have acquired much KNOW HOW in the blending of specials to enhance old standards. We shall be happy to check your problem forward and back. If your immediate problem cannot be stated on the coupon write it on your company letterhead.

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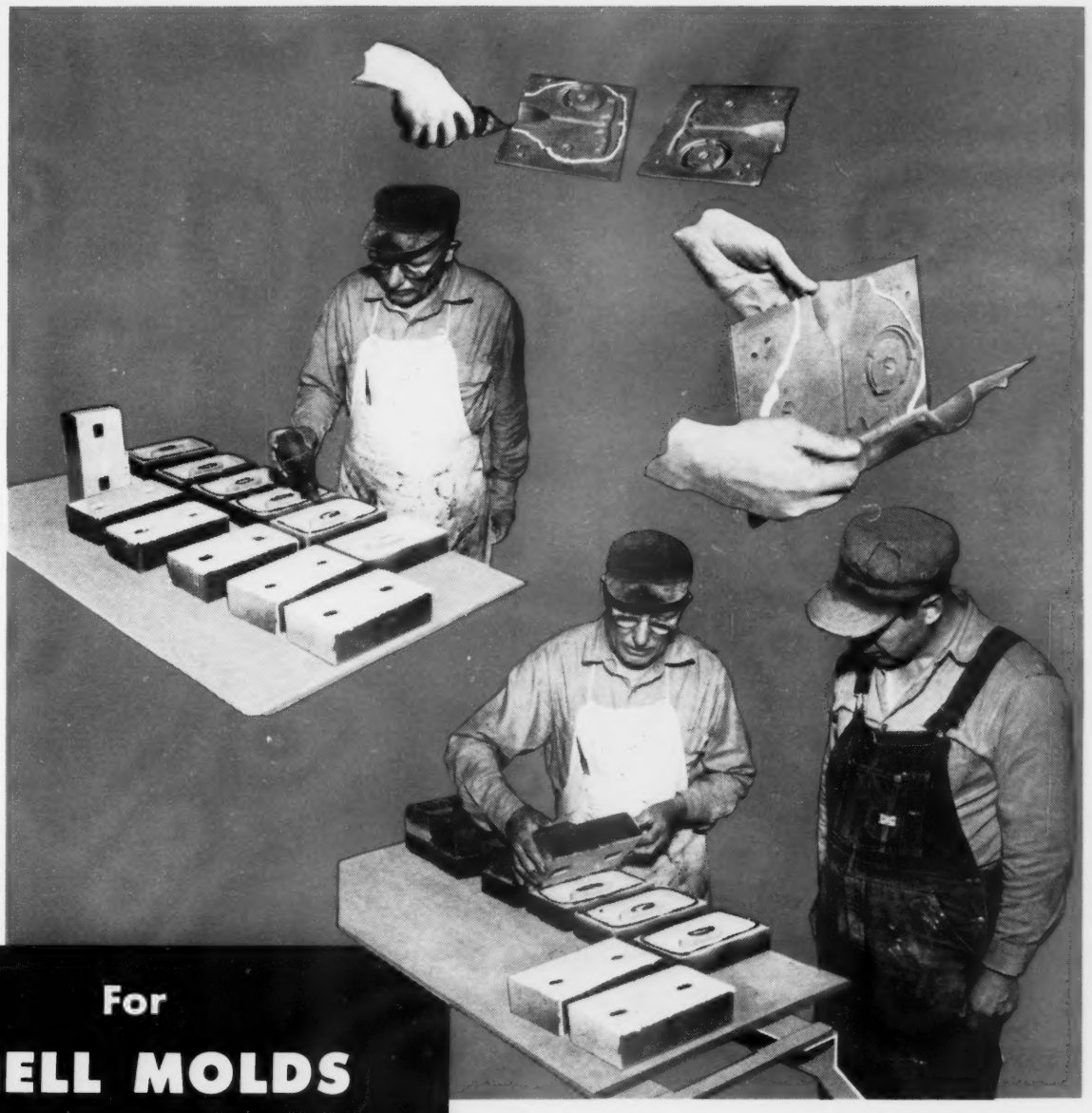

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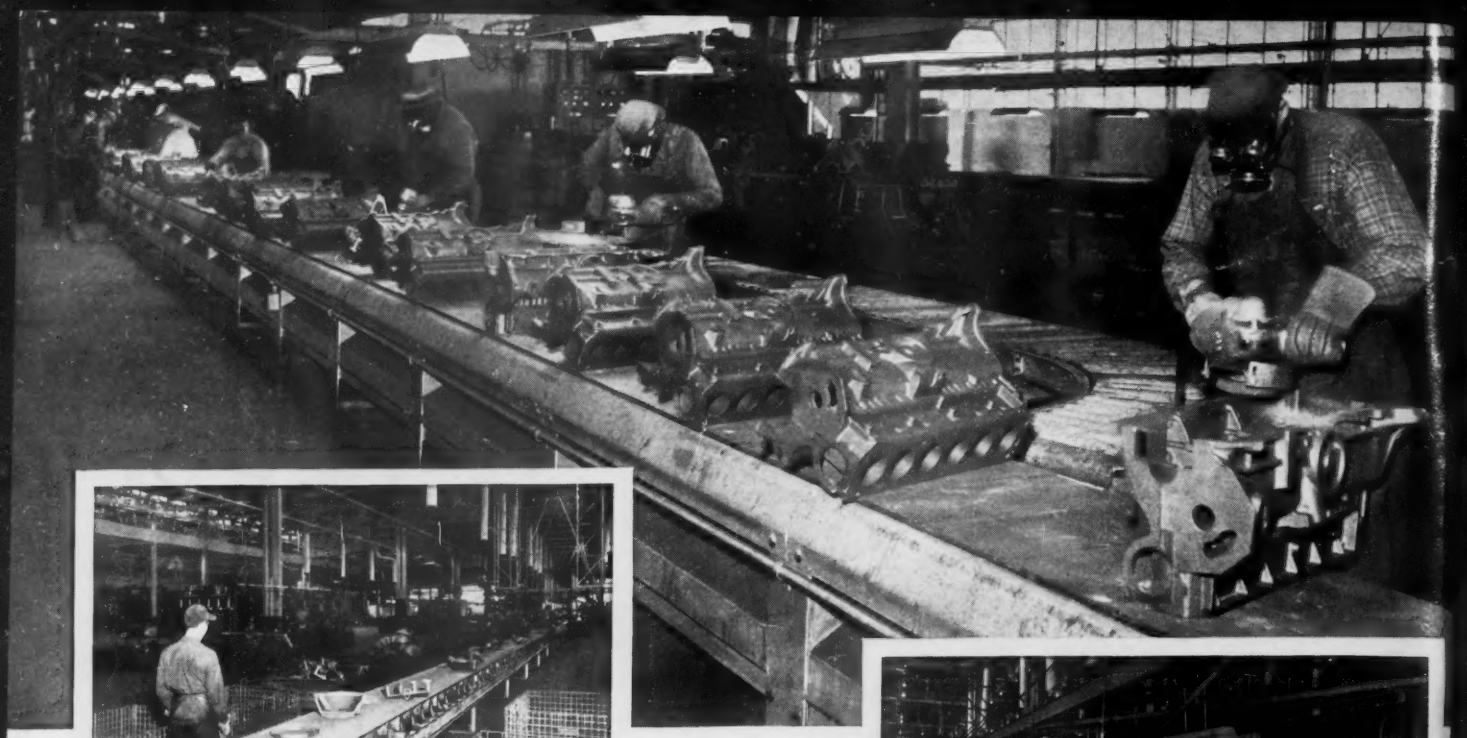
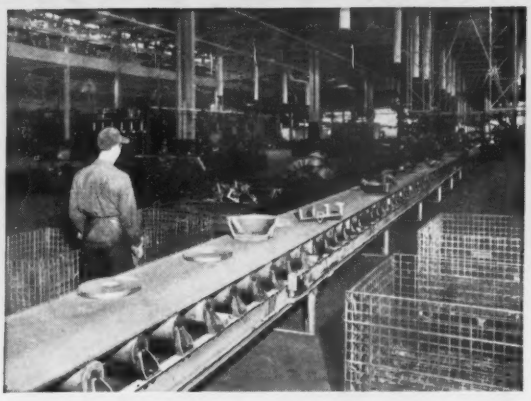




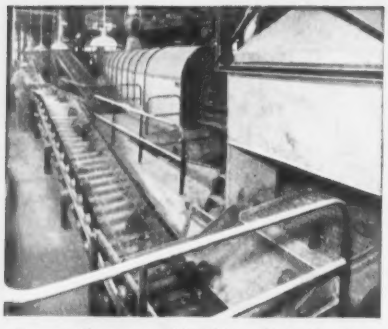
Above; Unloading Zone of 315′ Long Sorting Belt Handling Miscellaneous Castings After Grinding.

Above; 370′ Long—24″ Wide Flat Top Chipping Conveyor Handling Automotive Castings Through Various Cleaning Room Operations. *At the Right;* 130′ Long Chipping Conveyor for Finishing Head Castings.

Engineered Castings Handling Systems

. . . assure the continuous, uninterrupted flow of castings through chipping, grinding, sorting and inspection departments; — eliminate repeated handling and rehandling of work in process; — avoid stock piling between operations; — increase tons per hour production per man; — and reduce costs.

● Bartlett-Snow castings handling and cleaning room installations reduce the time and cost of handling castings from the shakeout to the shipping room. They synchronize and coordinate all cleaning room operations to the tonnage passing over the foundry shakeout. Belt, apron, oscillating, roller, car type and slat conveyors, engineered to meet your individual requirements!



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